

THE UNIVERSITY OF CAPE TOWN ARTIFICIAL LIMB

C. E. LEWER ALLEN, G.M., M.D. (RAND), M.Ch. (ORTH., L'POOL), F.R.C.S. (EDIN.)

Pieter Moll and Nuffield Professor of Orthopaedic Surgery, University of Cape Town

In the research and development of this limb the guiding principle has been to produce by mechanical means an apparatus which functions as closely as possible in the manner of a normal limb. While this principle has been carried to a useful practical stage, it is appreciated that its further perfection will open vast fields for future research. Hitherto lower limb prosthetics have relied upon a back-locking action at the knee by dorsiflexion, or its equivalent, of an equinus foot. As a result of this amputees have had to master special actions which deviate from normal gait and which necessitate extra work with consequent fatigue.

LOWER LIMB PROSTHETIC GAIT

A through-the-thigh amputee fitted with a standard-type prosthesis places the prosthetic heel on the ground ahead of him. He has to augment his forward momentum with additional muscle power in order to lift his body weight upwards. This lifting is considerably higher than is necessary on a normal limb because the prosthetic foot has to be limited as regards its ability to dorsiflex. When the prosthetic limb is in the vertical weight-bearing position with the weight taken essentially on the forefoot in order to produce adequate knee stability, the sound limb is swung forward into a position ready to commence taking body weight. At this stage, body weight has moved sufficiently far forward for the prosthetic knee to go into flexion. When weight is adequately placed on the sound limb, the amputee then swings his prosthetic leg past the sound leg, preparatory to recommencing the

walking cycle. In so doing he once again has to elevate the pelvis on the prosthetic side and exert muscular action to swing the prosthesis through in such a manner as to clear the terrain and any obstacles thereon. This latter action is rendered the more difficult by the prosthetic foot being either somewhat in equinus, or at least limited as regards its dorsiflexion, and most amputees require to swing their artificial leg outwards in an ungainly arc. Often an additional forward-flinging motion has to be imparted from pelvis and thigh stump to the prosthesis to ensure that the knee is braced back in extension for the safe commencement of the next walking cycle. The path through space traced by a point on the pelvis above such a prosthesis compares most unfavourably with the similar tracings described by such authors as Arthur Steindler,¹ and Saunders, Inman and Eberhart,² for normal gait. Lateral swaying of the pelvis and body varies greatly with different amputees, but in all of them it is evident from a study of these motion curves that the amputee needs to expend an excessive amount of energy. The gait with a standard type prosthesis is shown in Fig. 1.

Other Disadvantages of the Modern Prosthesis

Existing prostheses are crudely shaped, roughly to resemble an average limb. They are hard and unpleasant to touch, rough on the clothes and difficult to control in public places with close-spaced seating. They become dangerous when walking downhill and few amputees are able to walk downstairs.

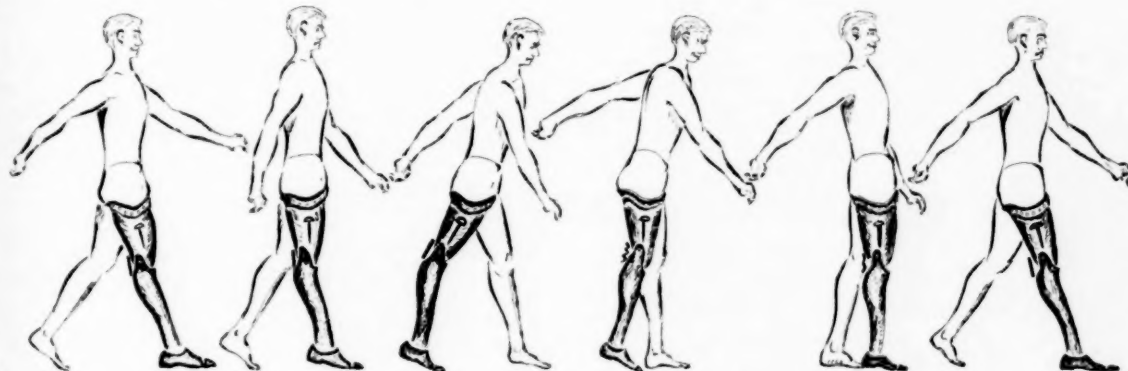
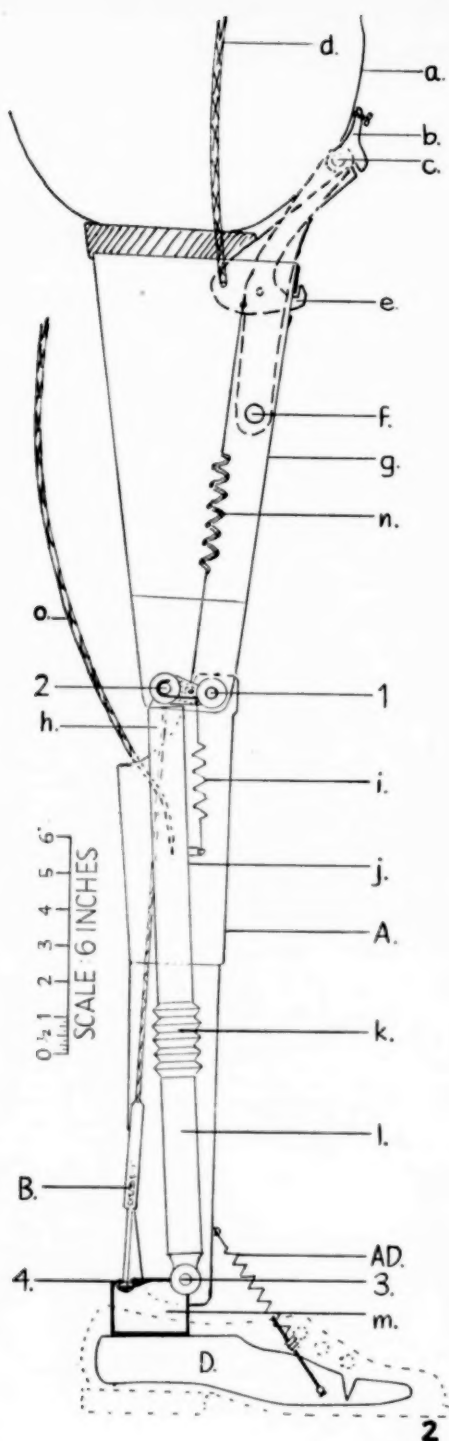


Fig. 1. Mediaeval in 1959—a gait as torturous of stump and Man must cease forthwith.



THE PRINCIPLE OF ACTION OF THE NEW LIMB

The foot and knee are coupled together in such a manner that dorsiflexion of the foot produces flexion of the knee. This combined action is controlled simply by incorporation between knee and foot-action of a hydraulic and spring-bias system. The thigh, if there is a stump, is fitted to a standard-type bucket. If there is an amputation through the hip or pelvis, a thigh-piece is coupled to a suitable glass fibre pelvic-moulded bucket by means of a hinge working on the principle of the 'Canadian-type hinge'.

Walking Actions

The body weight is transmitted downward through the limb and the foot is pressed down into an equinus position. The knee is in extension. The forward momentum of the body is accompanied by increasing pressure under the fore-foot, gradual increasing dorsiflexion of the ankle, and flexion of the knee. The pelvis on the prosthetic side rises slightly at almost the same rate as a normal pelvis in walking would do. Shortly after the pelvis has reached its maximum height, the normal leg is swung through in the normal manner while forward momentum of the body continues to flex the foot and the knee. After body weight has been taken on the normal limb, the pelvis on the prosthetic side is again lifted as in normal gait and the prosthetic limb commences to swing forwards gravitationally. The ankle and knee being flexed, the prosthetic foot easily clears the ground as the distance between foot and pelvis is thereby shortened. The knee and ankle remain flexed until the prosthetic thigh commences to pass the normal thigh, after which the prosthetic leg increases its velocity and the knee and ankle extend, preparing the prosthetic limb for recommencement of the walking cycle.

At no stage during flexion of the prosthetic knee or ankle does the controlling bias system become disengaged, and these movements can therefore be carried out in safety and without danger of the amputee falling. A control cable is fitted to the hydraulic mechanism of the bias system whereby the amputee can regulate at will the pressure, and consequently the rate at

- Fig. 2. (a) Glass fibre pelvic bucket.
 (b) Adjustable stop to pace-length regulator.
 (c) Canadian-hinge point.
 (d) Pull-cable control for sitting down.
 (e) Hinge lock coupled to pace-length regulator and knee-lock release.
 (f) Lower bucket-hinge pivot.
 (g) Thigh piece or bucket.
 (h) Cap to bias extension.
 (i) Knee-lock release spring.
 (j) Bias-extension tube.
 (k) Neoprene sealing bellows.
 (l) Hydraulic and spring bias system.
 (m) Ankle-pinion housing.
 (n) Knee-lock retaining spring.
 (o) Hydraulic needle-valve control cable.
1. Knee pinion; coupling leg to thigh piece.
 2. Upper bias pinion; coupling bias extension and false tendo Achillis to thigh piece.
 3. Ankle pinion; coupling bias system and leg housing to ankle-pinion housing.
 4. False tendo Achillis attachment on to ankle-pinion housing.
- A. Leg housing—can be set and riveted to patient's leg length.
 B. False tendo Achillis.
 D. Artificial foot.
 AD. Special spring.

which combined flexion of knee and ankle occurs. For walking downhill the pressure would normally be raised and these movements thereby more resisted. Setting of this control by the amputee is a matter of personal choice and is very quickly learned in much the same way as the controls of a motor car. In actual practice the control is not very frequently altered. A separate control releases the mechanisms at the knee and enables the amputee to sit down. Standing up automatically re-sets the connections and prepares the leg once again for walking.

THE ADVANTAGES OF THE NEW LEG

The flexion of the ankle and the knee during the forward movement on the prosthetic leg lowers the height to which the body weight requires to be lifted, thereby decreasing considerably the expenditure of muscular energy. The shortening of the leg by flexion of knee and ankle enables the prosthetic limb to clear obstacles easily and reduces the need for the ungainly outward swing of the standard prosthesis. The constant control during bending of the knee makes for safety, comfort and more normal habits of walking while, at the same time, placing far less stress and strain on the bucket-to-thigh stump attachments. Standing is for practical purposes normal.

The mechanisms required to obtain these actions have been so simplified that it has become possible to enclose them in a light metal skeleton-like housing. Plastic foam and sorbo rubber are then built on to this skeleton appliance, covered in turn by skin-tinted material and stockings shaped to match with accuracy the normal leg. This gives a softer and more pleasant limb to live with, which does not harm the clothing and which, by attention to cosmesis, serves to offer additional psychological rehabilitation, especially to women.³

DESCRIPTION OF THE LIMB

The component parts of the limb are shown in Figs. 2, 3-7, and 9.

The Foot

This, for convenience, has been made of wood with a hind portion and a separate toe-piece. The toe-piece is fastened into the hind portion by two plastic tubes, enabling it to flex easily within the shoe. The wooden foot is shaped to the amputee's shoe and it should be possible to fit any number of wooden shapes to fit different types of shoe, for example, high heels and flat heels. It should be prepared on its edges to receive the outer sorbo rubber shaped covering snugly. Attached to the hind portion of the wooden foot is a metal ankle-pinion housing.

The ankle-pinion housing should be attachable to the wooden foot-piece by a simple yet easily released method. Such attachment, however, requires to be very strong as the strains on it are great. The ankle-pinion housing itself is arranged to have a pivot of silver steel working in a teflon or nylon bearing antero-superiorly, and postero-superiorly an attachment for a cable which we will call the artificial tendo Achillis. In Fig. 2 the latter is labelled B and the point of attachment of the artificial tendo Achillis to the ankle-pinion housing is labelled 4. The ankle pinion to which the leg housing is attached is labelled 3.

The Leg Housing

The leg housing consists of two portions: (1) a lower 2-inch diameter drawn or extruded aluminium tubular portion,

telescopic in (2) an upper shaped aluminium portion. It is made telescopic for adjustment to the specific leg length of the patient, and after this length has been determined the lower tube is cut off and riveted to the upper aluminium part. The leg housing is attached to the thigh housing by a pinion labelled 1.

The Thigh Housing

The thigh housing consists of a standard type of bucket which has to be fitted to the patient, and the bucket in turn is attached to a thicker gauge aluminium lower part which contains the knee mechanism. For patients with amputations of the thigh no special part other than the knee mechanism is contained in the thigh housing, but for persons with an amputation through the hipjoint or the pelvis, the thigh portion requires to be specially shaped, being fitted with a hinge and a pace-length control. These will be described separately.

The Tendo Achillis

The leg is fitted with a false tendo Achillis which, in practice, works in a similar way to the tendo Achillis in the live body. This is a cable which is attached with a screw length-control mechanism to the ankle-pinion housing at the point labelled 4 and, above, to the thigh housing at a pinion labelled 2. This pinion 2 is also the upper attachment of the bias-control mechanism.

The Bias-control Mechanism

The most important part of the limb is this bias-control mechanism. It is contained between the two pinions of attachment labelled 2 on the thigh-piece and 3 on the ankle-pinion housing. The lower portion of the bias-control mechanism is a hydraulic cylinder containing a piston, a special collar, and adjustment mechanism and springs. This will be described separately. The upper part of the bias-control mechanism is, for convenience, a tubular extension of the lower portion attached to the piston shaft.

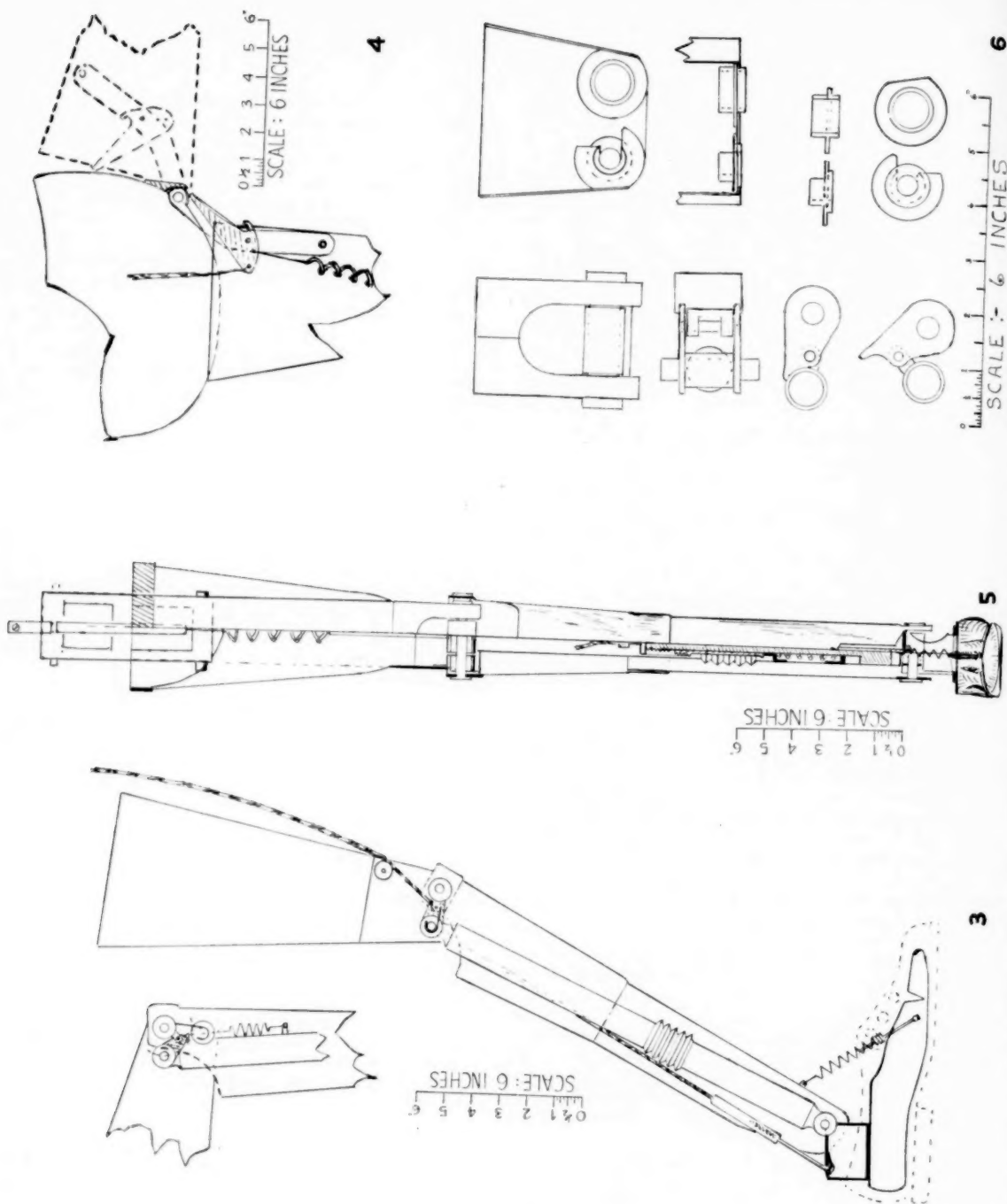
Special Spring

A special spring labelled AD is attached above to the leg housing and below to the front end of the posterior wooden foot portion. The tension on this spring is adjustable, and indirectly adjusts the behaviour of the main spring inside the hydraulic cylinder, as well as dorsiflexing the foot against the tendo Achillis.

The Hydraulic Cylinder

This consists of an outer casing and a piston to which a shaft is attached, the shaft passing through the centre of a special collar attached to the outer casing with precision-machined clearance. The shaft also passes through a guide ring and adjustment mechanism at the top of the hydraulic cylinder. Contained in the upper part of the cylinder is the main spring of special strength. The bias extension tube is indirectly attached to the shaft. Passing through the centre of the shaft is a needle valve which can control a small opening at the lower end of the centre part of the piston. A small neoprene sealing washer at the top of the shaft prevents oil leakage when the leg is turned upside down.

A sealing bellows made of oil-resistant neoprene is fastened to the bias extension tube above, and to the upper part of the cylinder of the hydraulic system below. This is to keep dirt out and to contain any possible leakage. Owing to the hydraulic cylinder design including a no-pressure chamber, leakage, for practical purposes, does not occur.



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The hydraulic system is divided into 3 chambers. The lowest is a chamber under high pressure when the piston is being pushed downwards carrying the weight of the amputee. This chamber is below the piston. The second chamber is the chamber formed between the upper part of the piston and the special collar through the centre of which the shaft moves. This chamber at times is also one in which oil is under considerable pressure. A third chamber exists between the special collar and the top of the hydraulic cylinder. This is the no-pressure chamber. It is in this third chamber that a special spring is placed to fit comfortably round the shaft. On insertion, it is compressed to give a pre-loading of between 30 and 40 lb.

The piston is designed to have sinuses through it in such a manner as to permit oil to flow in the proper way.

The Action of the Bias System

Piston downstroke. When the shaft is pressed downwards, oil is compressed in the lowest chamber, passes through a little central hole in the bottom of the piston where the rate of flow is controlled by the point of the needle valve. The needle valve is in turn controlled through an attached flexible cable by the amputee. This compressed oil flows through the piston into the middle chamber. The middle chamber is of smaller volume than the lower chamber because the shaft in this chamber displaces a certain volume of oil. Thus, oil being displaced through the piston will, in part, have to find a passage between the special collar and the shaft into the upper, or no-pressure, chamber. In this way the piston descends slowly at a rate determined, in the first place, by the setting of the needle valve.

The amputee's flexible cable control is brought up alongside the thigh piece to the person's clothing, where it can be worn either in a pocket, or as a button, or in any of a number of convenient ways. If he screws his needle valve down, he will allow less oil to pass through the piston and thus slow the rate at which the piston is pressed down.

While the shaft and piston are being pressed downwards, the special threaded adjustment apparatus at the top of the cylinder and attached to the shaft moves downwards compressing the main spring, and this loading of the spring determines the power with which the leg can be straightened again.

A convenient landing spring can be inserted at the bottom of the lowest chamber for the piston to compress as it gets near the bottom end of its stroke. Thus, at the end of the compression stroke, the spring in the upper chamber has become compressed and stores potential energy ready to push the piston upwards again.

The upward stroke of the piston. The shaft and piston in moving upwards are driven by the previously compressed spring in the upper chamber. Most of the oil will find its way back to the lowest chamber via the same channels as were

used on the down stroke. Some oil, however, is sucked through a hole made just above the collar in the shaft, and this oil will pass down to the piston through the central shaft lumen. Thereafter it enters sinuses in the piston, lifting little ball valves and re-entering the lowest chamber. The piston will continue to rise in this manner until all except the pre-loaded potential energy stored in the spring in the upper chamber has been used. As described above, the bias-extension tube, being attached to the shaft, will rise and fall with the shaft and piston, compressing the sealing bellows on the down stroke, and elongating the bellows on the up stroke.

Knee-lock Release Mechanism

This mechanism has become very much simplified and consists of a means whereby the pinion labelled 2 can be dislodged from its position to enable the knee to hinge on the pinion labelled 1 for the purpose of sitting down. This knee-lock release control can have a small cable attached to it, or some such similar mechanism, conveniently arranged for the amputee to use at will. On standing up, the pinion 2 automatically reassumes its normal position in relation to 1.

The Pelvic Bucket and Hinge Mechanism

This bucket is constructed according to the description of the Canadian bucket. It is, of course, used only for persons who have an amputation through the hip joint, or a hind-quarter amputation. It is made at present of glass fibre and fitted to include the stump tissues and pelvis. Its under surface is carefully shaped so that the thigh portion can conveniently abut underneath the bucket in the upright position.

The thigh piece is attached to the pelvic bucket by a hinge which employs in principle the concept of the Canadian-hinge system. Incorporated in the hinge is a small adjustable pace-length regulator. Also for convenience the thigh piece is topped with a rubber edging to cushion it against the under surface of the bucket. In the University of Cape Town limb the hinge is especially arranged to permit the thigh piece to swing from its position underneath the bucket, as used in walking, to a similar position in front of the bucket for the purpose of sitting down. The knee release mechanism is coupled to a pelvic bucket hinge-release to permit this to occur.

By means of this special method of hinging it is possible to maintain the proper proportional relationships of leg and thigh lengths in both upright and sitting positions.

HOW THE PROSTHESIS WORKS DURING THE MOVEMENTS OF WALKING

The movements of walking with the new prosthesis are shown in Fig. 8.

In position 1, the amputee is preparing to take a pace. The heel of the prosthesis is being placed on the ground. The body weight of the patient is being thrust down the apparatus. The foot, hinging at pinion 3, is being depressed into a plantar flexed position, elongating the spring AD (Fig. 2).

The prosthetic knee is in a position of extension about the pinion labelled 1. The tendo Achillis, B, is slack. The piston in the cylinder is in the up position. The amputee's body weight is being thrust forward by the impetus of his walking action and by the good leg. As his pelvis rises towards the upright position on the prosthetic leg, the foot becomes slowly dorsiflexed and the tendo Achillis, B, becomes tight. As it tightens it tends to draw pinion 2 towards pinion 4 and

Fig. 3. The coupled action of dorsiflexion of ankle coordinated with flexion of the knee. In this figure the limb is represented as for a through-the-thigh amputation to demonstrate the alternative knee-lock release for such cases. Above. The knee as in sitting.

Fig. 4. The movement of upper thigh piece on pelvic bucket from standing to sitting positions.

Fig. 5. Front view. Half-section drawing.

Fig. 6. Sketches of the knee-release link and the knee fittings in their housing.

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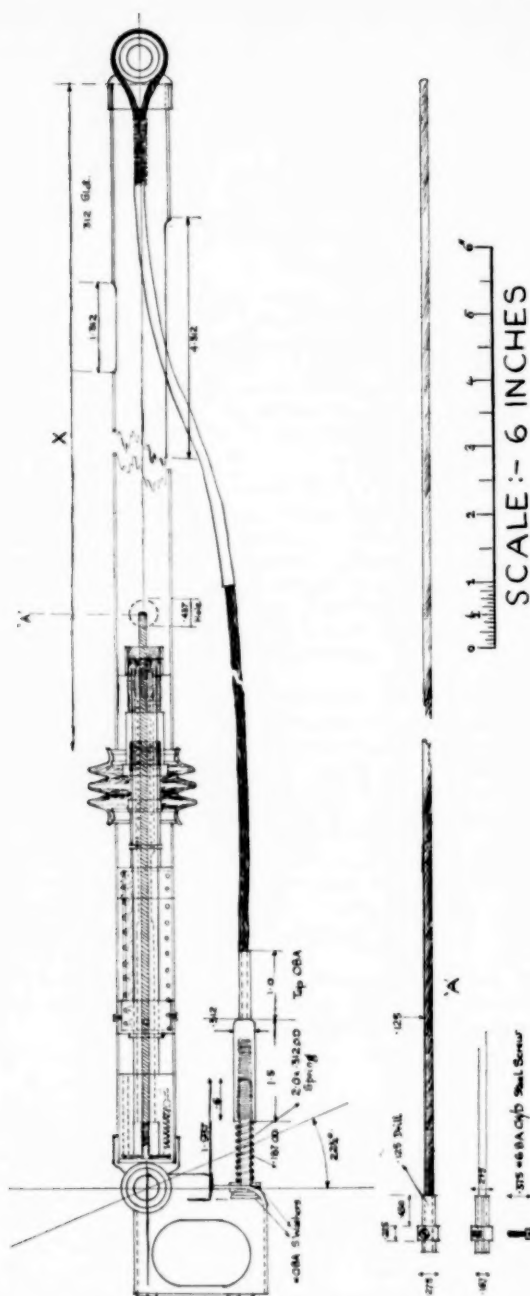


Fig. 7. The hydraulic-spring bias system. In this diagram no landing spring is inserted. Hydraulic-bias extension cap at the top of hydraulic-bias extension should have longer skirts. Length X adjusted as required for patient's leg length.

this brings about a flexion of the knee. The rate of flexion of the knee is controlled by the compression which results from the downward movement of the piston in the hydraulic cylinder. Thus, in position 2 flexion is beginning to occur at the knee and dorsiflexion is occurring at the ankle. The patient is stable throughout all movements. He can take his full weight on the apparatus. The compression of oil in the lowest chamber by the piston has been regulated to the patient's body weight by himself by adjusting his needle valve through his cable.

In position 3, flexion of the ankle is continued and, with it, flexion of the knee. The piston has moved downwards, almost to the bottom of its stroke in the lowest chamber; it has displaced oil in so doing into the middle chamber, and some of this oil has passed through under the special collar into the no-pressure or upper chamber. At the same time, the spring in the the upper chamber has become steadily compressed. Stability increases, as does the flexion of the knee and ankle. The normal limb has been swung past the prosthetic limb in readiness to commence taking body weight.

In position 4 the normal limb has been placed upon the floor, the prosthetic limb is maximally flexed at the ankle and the knee, and the patient has commenced lifting the pelvis on the prosthetic side. The prosthetic limb can move forward ready for weight bearing, clear of the ground, because the leg length is shortened by the flexion of the knee and ankle.

In position 5 the prosthetic limb is being swung forwards. At this position, where the prosthetic thigh has not yet passed the normal thigh, the rate of oil flow in the cylinder has been so arranged as to prevent rapid extension of ankle or knee, i.e. the clearance between shaft and collar is minimal. The piston is returning by the action of the spring in the upper cylinder; the oil is passing back through two channels into the lowest chamber, in the first instance through the same sinuses that it fed upwards on the down stroke, and in the second instance by lifting the small ball valves in the piston and returning via its own special sinuses. Resistance to the return passage upwards of the piston enables the knee and ankle to be kept properly flexed for clearing the ground until the two thighs pass one another.

After the prosthetic thigh passes the normal thigh, however, the velocity of straightening of the knee and ankle is increased, and this has been achieved by locally tapering the shaft as it passes the collar, thus rapidly allowing a flow of oil to occur when desired. This local tapering of the shaft supplies mechanically the same action to the prosthesis as does the quadriceps muscle in a normal limb.

In position 5, then, we can see how the shortening brought about by flexion of the knee and ankle at the same time facilitates the clearance of the ground and mitigates undesirable outward-flinging actions.

In position 6 the amputee is still bearing his weight on his normal leg and, although the prosthetic leg is not yet in position to place its heel on the ground, it has already become straightened at the knee, and ankle and foot are ready for the next weight-bearing step.

Further Improvement

We have designed, but not yet adequately tested, a simple addition. The inclusion of a small cam-like link between the ankle-pinion housing and the ankle pinion is expected to cause still further temporary flexion at the knee when the body weight is taken off the prosthesis.

If successful, this will make an even more profound advance by further imitating natural gait and by increasing clearance ready for the swing past of the prosthetic leg.

MANUFACTURE OF THE LIMB

Parts Made by Factory

The hydraulics, the knee mechanism, and the hip hinge require to be precision made. Some of these parts need to be specially hardened. These should be constructed by engineers capable of normal precision work. The metal housings for thigh, leg and ankle pinion would best be made by experts in sheet-metal work. This sort of work is already being done by present-day manufacturers of artificial limbs. The shape of these components has been simplified in order to lower the manufacturer's costs. Cables with a good range of adjustment on their swagings should be supplied attached to their components. This applies also to springs.

The foot should be made by wood machinists who use a master foot and make any number by means of parallel spindling. It would be of advantage, if the manufacture of such foot pieces proved reasonably inexpensive, to supply different feet particularly to women who may wish to change shoes. The University of Cape Town foot is greatly simplified as compared with the foot of present-day prostheses, and factory production should be simple and cheap.

The Work of Technicians

As in modern lower-limb fitting, the technician's work would involve putting the pieces together and fitting them to the patient. There is no difference as regards bucket fitting which remains as it has always been. The work required in fitting shoes to the artificial foot should be rather less with the University of Cape Town foot and simple techniques can be evolved and improved upon with the passage of time.

The fitting of the completed leg to the patient should also be rather simpler than is the case with modern standard lower-limb prostheses, except in the patient with the through-the-hip, or hemipelvectomy type of amputation. In such cases the technique to be followed is virtually as laid down by the Prosthetics Research Board, Canadian Research Council for the Canadian Type of Hip Disarticulation Prosthesis.⁴ Details of technical method will still require to be improved for obtaining the alignment of the components of the limb in the above-hip amputation cases.

Limb Length Adjustment

This will be the orthopaedic technician's province. The thigh-piece top will have to be cut and shaped so as to bring it into good contact underneath the pelvic bucket in trans-hip and hemipelvectomy amputees. This must be done with due regard to the proper thigh length from knee to anterior superior iliac spine. In trans-thigh amputees this is simpler, but nevertheless the weight-bearing distance from knee to anterior superior iliac spine must again be kept the same as on the normal side.

The leg length adjustment is then determined and set by sliding the drawn tube of the leg housing in its upper shaped piece and then cutting and riveting.

Having determined the leg length, the technician must then cut the top of the bias-control extension tube to its proper length and attach its pinion-carrying top piece. This is sweated on with soft solder. Final delicate adjustment of the bias-control length is then made before fastening the neoprene sealing bellows into place by screwing the bias-extension tube in or out as required.

These adjustments are all simple when understood. Special care has been devoted in design to accessibility of components, thus cutting down the technician's fitting time as far as possible.

The only additional duty the technician has, is the making of suitable rubber coverings to the shape of the limb which has been lost. This is done as follows:

The patient's normal limb is laid sideways on a piece of template paper and a pencil held vertically traces the anterior outline of the limb from the groin to the dorsum of the foot. At 2 or 3-inch intervals the hemicircumference of the normal leg is projected backwards from this anterior profile on the template. A faired line, joining these hemicircumferential loci, is then drawn and the template cut. This template is placed over two $\frac{1}{4}$ -inch thick sheets of sorbo rubber and the rubber sheeting cut to the shape of the template. The front and back edges of the sorbo-rubber shapes are then joined together by a suitable adhesive. By this method a reasonably accurate limb shape can be obtained simply and quickly.

Conveniently shaped small pads of plastic foam are glued where desired on to the metal leg and thigh housing to make this sorbo-rubber covering conform more accurately to the leg shape in mirror image to the healthy limb. With a little

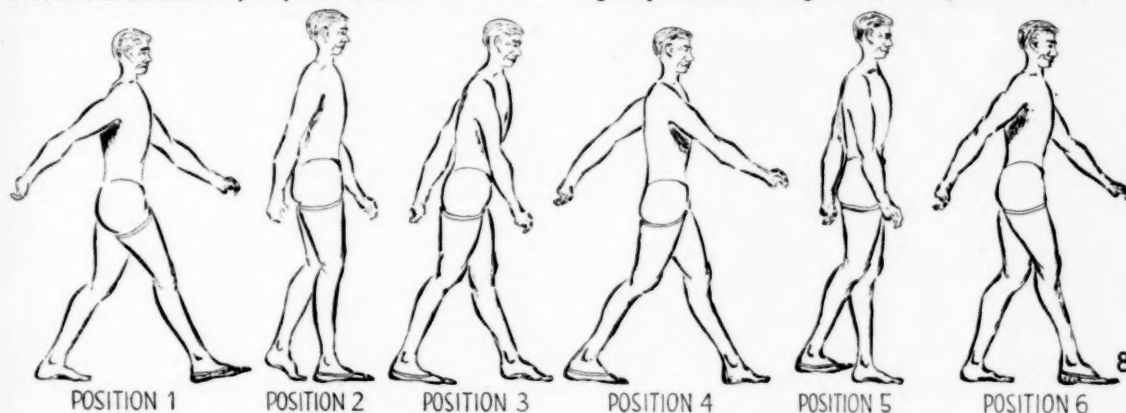


Fig. 8. The gait with the University of Cape Town prosthesis, showing positions 1-6.



Fig. 9. Cut-away schematic drawing of the University of Cape Town prosthesis.

practice the technician will find this much simpler than it sounds. On our experimental limbs we are now rapidly able to obtain a shape which would deceive even an expert eye.

All this technique requires to be developed further. It is possible that rubber companies which manufacture sorbo rubber may one day make ready-made rubber sheaths which could easily be shaped to suit.

The rubber covering requires to be fastened to the wooden foot-piece and this can be done in a number of ways.

In turn, the rubber is covered by a suitable skin-tint material. We have found a pair of acrobatic tights suitable for this. One leg-piece is cut off and over-stitched to prevent running, and pulled over the sorbo-rubber cover. This, in turn, is covered by the patient's own socks or stockings.

General Technical Data

Sheet work generally. 16 s.w.g. $\frac{1}{2}$ -hard aluminium. Rivets are $\frac{1}{8}$ -inch diameter aluminium.

Pivots. Silver steel running in teflon bushes.

Release and locking devices. Mild steel, case-hardened and double quenched.

Wooden foot. Birch.

Hydraulic cylinder. Stainless steel honed; piston m.s. ground, and shaft silver steel. Needle valve is silver steel and return valves $\frac{1}{8}$ -inch ball bearings.

Oil. Multigrade S.A.E. 10 W-20.

Sealing bellows. Neoprene.

Falsetendo Achilles. Bowden cable 20 strand, 30 s.w.g. per strand.

Coverings. Outer, $\frac{1}{2}$ -inch thick foam rubber with smooth outer skin coloured appropriately for patient's skin colour. Fillings and padding are foam plastic.

PATENTING

The University of Cape Town Artificial Limb has been patented and the right to make it requires to be obtained under the patent from the National Council for the Care of Cripples in South Africa.*

The main purpose in patenting this principle and design of lower-limb prosthesis has been to ensure that the limb does not become unreasonably exploited commercially. The act of patenting the apparatus was only adopted after deep consideration, and finally provoked by the growing tendency for over-commercialization in the field of such medical apparatus. It is strongly felt that it is a wrong principle to make a handicapped minority pay for royalties. Nobody at any time may draw royalties from the invention, or the principles which are used in the invention of this limb. It is hoped that this principle will become observed, not only in respect of this particular limb, but also in respect of other apparatus which is needed for handicapped persons.

As regards the limb itself, it is our earnest plea that future improvements which may be made from time to time by persons in any part of the world will be carried out by those who appreciate the importance of this humanitarian principle and who will observe an altruistic viewpoint in regard to it without attempting to patent for personal gain.

Although the research unit in the Department of Orthopaedic Surgery is in dire need of funds, it has nevertheless spurned the opportunity of claiming royalties, even in the face of its not being able to further future research for this reason.

* This matter is still under discussion

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WORKING DRAWINGS

The detailed working drawings will become obtainable through the National Council for the Care of Cripples in South Africa* by persons who agree to manufacture the limb under the simple conditions laid down by the patenting act, namely that no undue profit and no royalties be drawn from the patenting.

BELOW-KNEE PROSTHESIS

Throughout a day's walking on a standard below-knee prosthetic limb both stump and amputee suffer severely. By applying the University of Cape Town limb hydraulic cylinder, fixed above to the leg housing and below to the foot, the shock of the amputee's weight on the heel can be absorbed. The foot can go into dorsiflexion on the forward prosthetic weight-bearing pace and this dorsiflexion can be maintained for ground clearance, as for the above-knee prosthetic limb. Obviously the problems of below-knee prosthetics are simpler than those for above-knee.

CONCLUSIONS

1. The prevalent principle in above-knee prosthetic design of obtaining knee stability by knee back-bracing against a down-toed foot is a violation of good anatomic principles and must for ever be discarded.

2. The new principle to take its place is that mechanical devices must aim at action which is as near as possible to that used by the normal person.

3. Even the materials used should be so chosen and employed as to replace as reasonably as possible what has been lost.

4. If the above three principles are observed, much will be done towards far-sighted rehabilitation in its widest sense.

5. A renaissance is required through which fundamental research should return to the control and direction by universities. There has been a dangerous drift of scientists and their work towards specific and commercialized research. Such a drift must ultimately result in sterility in all spheres. Although this trend is not discussed in this article, it should be mentioned because the work done in developing this limb and its principles of action has been in the face of such difficulties which have made this point abundantly clear.

6. The growing dangers of selfish monopolistic over-commercialization of apparatus and medical requirements of the needy are real. The world must become conscious of this and take rational action.

This has been done in this work by using the protective mechanism of patenting the principles and mechanical design of the University of Cape Town Artificial Limb.

SPECIAL RECOGNITION OF ASSISTANCE

Described in this article is the University of Cape Town Artificial Limb in its final and very simple state. This limb has taken many years to evolve; it has not become a fact by accident. However, even years of sound research and the knowledge of what was required was not enough to bring about its realization. An expert precisionist and designer had to be found, capable of translating a quasi-mechanical academic concept into mechanical reality. This expert was found in the person of Mr. L. V. Holmgren.

* This matter is still under discussion

Mr. Holmgren, a principal mechanical assistant of the Trigonometrical Survey Department of Cape Town, voluntarily devoted most of his spare time over the first 2 years of the project. He constructed many special models, drawings and diagrams, and was mainly responsible for the evolution of the mechanical apparatus to its present simplified form. I therefore wish to thank him especially for the work he has done.

The Patient

The voluntary patient, Mrs. J. Tribelhorn, was selected partly because she presented the challenge resulting from a hip-disarticulation amputation, and largely for her courage and qualities as a factual observer. She has had to travel 300 miles each way for fitting with each new prototype, and to tolerate falls and frights similar to those experienced by an aeronautical test pilot. We are all grateful to her for the part she has played so admirably.

I wish to thank the University of Cape Town under whose auspices my Department has been enabled to do this work, and the Dean of the Faculty of Medicine, Prof. B. Bromilow-Downing, for his valuable guidance over relationships between Provincial Departments and the University.

I also wish to thank the National Council for the Care of Cripples in South Africa, which has made available funds for tools and apparatus and for the purpose of patenting the limb for its protection. Without this help the work could not have reached its present stage of success.

The Hospitals Department of the Cape Provincial Administration has given every assistance permitted by their regulations. The Provincial technicians under Mr. D. Louw, Mr. T. O. Davies and Mr. R. C. Vigus have earned my gratitude for their assistance; also Mr. A. H. Hodges, who helped to make the first pelvic bucket for Mrs. Tribelhorn.

I thank Mr. G. McManus of the Department of Surgery and Mr. R. C. Hampton for the time they have given us in mechanically assisting Mr. Holmgren.

Photography and cinematography were carried out by Mr. G. McManus, with the kind consent of Prof. J. H. Louw, Head of the Department of Surgery, and by Mr. B. T. A. Todd, by kind permission of the Medical Superintendent of Groote Schuur Hospital, Dr. J. Burger. I extend my special thanks to both these photographers, and also to Mr. J. Linney of Thornton Estate, for voluntarily coming to our aid in taking the last test cinematograph reels.

Finally, I wish to thank Mrs. J. Forsyth, my secretary, for the immense amount of correspondence work she has coped with and the time she has devoted to translations, and for many organizational matters which she has attended to.

Two donors, who wish to remain anonymous, have each contributed an amount of £1,000 to start a fund for future research in the Department of Orthopaedic Surgery, University of Cape Town.

As no South African Council for Scientific and Industrial Research grant had been made before the completion of this work no acknowledgement was possible, but the CSIR have since granted the Department a small sum of money for additional assistance for future work in 1960. This is appreciated.

The British Commonwealth Ex-Services League have magnanimously offered to carry out the first 6 'guinea-pig' trials before manufacture can become possible. This is consistent with the spirit of BCESL members and is an outstanding offer.

A Government organization is giving consideration to making the first manufacturer's test run for their own employees as soon as the BCESL test has proved successful.

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DYSTONIC REACTION TO PERPHENAZINE (TRILAFON)

A. M. BARNETT, M.B., B.Ch. (RAND), Johannesburg

Since the introduction of chlorpromazine (Largactil) 7 years ago, many related drugs with generally similar actions have been discovered. These drugs include prochlorperazine (Stemetil), promazine (Sparine), trifluoperazine (Stelazine), trifluorpromazine (Siquil) and perphenazine (Trilafon). They are widely used for their anti-emetic action, as tranquillizers, and for the treatment of migraine and vertigo. In psychiatric practice they are very useful in severely agitated and confused patients, as well as in schizophrenia. Minor toxic effects occur fairly commonly, including rashes, transient hypotension, and manifestations of parkinsonism. Serious side-effects although rare may be bizarre and frightening.

The following case report illustrates an alarming reaction resembling tetanus, which followed the administration of perphenazine.

CASE REPORT

A 30-year-old European man, a bricklayer, injured his back on 11 June 1959. He was diagnosed as having a herniated intervertebral disc at L4-L5. He improved after treatment with leg traction but 2 weeks later severe pain recurred and his spine was manipulated under general anaesthesia. Two days later a plaster-of-Paris jacket was applied and perphenazine (Trilafon) tablets were started in a dose of 8 mg. twice daily. After 48 hours he felt completely well and was discharged.

Several hours after discharge he began experiencing sharp pain in his shoulders and in the muscles at the back of his neck. The pain was not related to any movement, and became progressively worse. His mouth felt dry and his vision was blurred. An hour after the onset of pain he experienced the first of many spasms during which he went into opisthotonus. These spasms were very painful, lasted 2 or 3 minutes each, and recurred about 8 times an hour.

When seen 1 hour after the first spasm he was very anxious and in considerable pain. He was apyrexial, the pulse rate was 96 per minute, and the blood pressure was 110/70 mm. Hg. In the next 20 minutes he had 3 episodes of spasm of the extensor muscles of the neck and spine. During each spasm he went into opisthotonus, his jaws were clenched and his arms were abducted and externally rotated. The spasms were spontaneous and not provoked by any stimuli. Between spasms the pain was less severe, he could open his mouth widely and was able to move all the affected muscles. His vision was blurred and both eyes were deviated upwards. On looking to the left he had diplopia and a fine nystagmus was present. No other abnormal physical signs were elicited. A diagnosis of drug reaction to perphenazine was made and he was given 100 mg. of pethidine intramuscularly.

In the next 30 minutes 3 further spasms occurred, the last of which was milder and shorter than the previous ones. After this they ceased completely. Two hours later he felt better, although his shoulder and neck muscles felt bruised and sore. His eyes were no longer deviated upwards but the nystagmus and diplopia

were still present. He was given 1½ gr. of pentobarbital sodium and the next morning he felt well and all abnormal physical signs had disappeared.

COMMENT

The phenothiazine derivatives are extremely useful and widely used drugs. Their side-effects are similar and the commonest one is a syndrome which resembles parkinsonism. Tremor, oculogyric crises and localized muscle spasms have frequently been described and usually disappear after reduction of dose or cessation of therapy. In a few cases anti-parkinsonian drugs may be needed.

In the usual dosage of 4-16 mg. daily perphenazine is generally safe, even if used for long periods of time. In psychiatric practice much larger doses have been used without serious incident. Agranulocytosis and cholestatic jaundice have been reported in rare instances as following the administration of some of the phenothiazine derivatives. A further severe side-effect of this group of drugs is a dystonic reaction similar to the one described above. It has been reported after the use of chlorpromazine, trifluoperazine² and perphenazine.¹⁻³ In some of the cases which followed perphenazine administration the reaction occurred soon after commencing therapy. Montgomery and Sutherland⁴ mention that a single 4 mg. tablet may be sufficient to provoke this reaction. In the case described in the present article it developed after a total dose of 40 mg. had been taken in 48 hours. There was probably an abnormal sensitivity or idiosyncrasy to the drug.

When the case was first seen the resemblance to tetanus or to strychnine poisoning was more than superficial. Unless one is aware of the possibility of such a drug reaction, considerable worry and confusion may result. The reaction is a short-lived phenomenon and responds rapidly to sedatives.

SUMMARY

A case of a severe neuromuscular disorder resembling tetanus is described. This reaction followed the use of perphenazine and responded rapidly to sedation.

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FORTHCOMING INTERNATIONAL MEDICAL CONFERENCES

International War-prophylaxis Congress for Physicians. This Congress will be held on 23-28 May 1960 at Grand-Hotel Huis ter Duin, Noorwijk-on-Sea, Holland. Proceedings will be conducted in 3 languages, English, French and German. Among the speakers and discussion-leaders there will be prominent world-federalists, world citizens and world-parliamentarians. Entertainments have been organized including excursions to the famous bulb fields, The Hague, The Peace Palace, Amsterdam, and the canals and museums, etc. There will be a closing banquet and other receptions. The Head of the Congress Organization is Prof. M. Knap, 46 Schubertstraat, Amsterdam, The Netherlands, and those wishing to deliver speeches are asked to contact this address.

International Society of Cybernetic Medicine. This Society was constituted in 1958, with the participation of 19 countries, and held its first General Assembly in Naples last November. The Assembly elected the following office-bearers: President, Prof. Aldo Masturzo of Naples University; Vice-President, Prof. Paul Nayrac of Lille University; members of the Council, Profs. N. Wiener, G. Asboe-Hansen, F. Nember, A. Gata and C. Coruzzi. The Society has decided to organize an International Symposium on Cybernetic Medicine in Naples during 1960 in which Prof. Norbert Wiener will participate. The address of the office of the Secretary-General is Via Roma 348, Naples, Italy.

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THE UNIVERSITY OF CAPE TOWN ARTIFICIAL LIMB

In this issue of the *Journal* we publish a report by Prof. C. E. Lewer Allen on the work done in his Department in designing and making the University of Cape Town Artificial Limb. At the time of publication only one patient has walked on this limb. Within a short time a selected group of patients will put to test the first manufactured prototypes of the limb and we can be confident that the work done by the Department of Orthopaedic Surgery of the University of Cape Town will be proved a success. By giving this work to the world now, rapid improvement of the techniques involved may be made by research teams in other parts of the world.

The struggles and difficulties overcome by this University's Department of Orthopaedic Surgery in this project have been an inspiration to many who have met with the frustrations at present rife in some of our university activities. It would be pertinent, therefore, to glance objectively at this problem.

The proper place in our society for the university and its activities is in the forefront of modern advancement of knowledge. Our scientists and workers in the university are selected from the best in their spheres of work. If they are enabled to devote their time to the advancement by research of the newest and most original developments in their own spheres, the student, placing himself under such masters, will in truth be benefiting in the proper way; the way implied by the very word 'university'. Unfortunately, there is far too little promotion of research in our universities today, and the danger is that the students tend to be fed too freely on the standard text-books.

An examination of this state of affairs brings to light certain rather alarming facts. Lack of finance for university research imprisons excellent brains within cloister walls where they are unable to obtain funds for research. As a result there is a real and human tendency for young scientists to drift away from the university towards industry which offers the materials and equipment they require. This drift may not, on the surface, appear to be a dangerous thing, yet in a subtle way it is. For a very long time industrial firms have employed scientists and research workers. The work done by these people differs subtly from the work they would do if they remained in a university. The scientist in a big fishery project, for instance, would have to focus a great deal of his thought on helping his company to catch fish, or on turning the fish into more money. Many similar examples could readily be found. The research worker in a university, on the other hand, would be devoting his time to the search for truth, wherever that search might lead him. Such basic research is the true and healthy pabulum of advance. Without it our various fields of science must inevitably become arid or sterile. The scientist in industry has become an ever-growing necessity; but without the atmosphere of research for truth's sake his potential must inevitably disappear and scientific sterility supervene. Furthermore, techniques, wisdom and judgment can only be acquired by the young scientist if he remains long enough

for solid grounding in the atmosphere and spirit of basic research before going out into the commercial and industrial world. Unfortunately, here again we see the drift referred to in the conclusions of Professor Allen's article. Salaries paid to scientists in our universities are, of necessity, far too low by comparison with the inducements offered by external enterprises, and gifted young men and women leave their Alma Mater all too early.

What then is the remedy and how can we bring about the renaissance called for by Professor Allen's conclusions? This is surely a problem demanding international attention. It is becoming apparent that those who benefit from the services of scientists and research workers should at least begin to appreciate what is more than a moral duty, what is in fact and truth a debt that they owe to the universities which produce the scientists and the basic research. The results of basic research have often been given to the world in an altruistic spirit, and a good example of this is the University of Cape Town Artificial Limb. But the time has come when the world should appreciate the full value of the spirit in which such knowledge is given, and be prepared to pay generously for it.

Until now, many donors have been satisfied to salve their consciences with the odd sop in the form of a donation towards a scholarship or bursary. This is not enough if we are going to revive the vitality of research in our universities. The domestic story of the University of Cape Town Limb is one of frustrating and humiliating struggle. Materials had to be begged for, and without the voluntary services given by Mr. L. V. Holmgren in his spare time, until seconded in the last year of this work to the Department of Orthopaedic Surgery, these advancements, of immeasurable value to the world, would not have come into being. For two years the essential work on this project had to be done in home workshops, with the occasional voluntary permission to use other workshops. The loss of valuable time in the compilation of a vast number of memoranda and correspondence to obtain assistance was indeed frustrating and must have slowed up this project seriously. Surely, then, we cannot allow Professor Allen's appeal to pass unheard, the appeal for greater freedom to carry out the immensely important basic research which should be the prerogative of our universities.

A second important principle arising from this work merits our attention. There has been an increasing tendency to over-commercialize medical requirements. Are we to stand by and watch these things happen when they appear to be assuming sinister proportions? These remarks apply, among others, to appliances and apparatus required by the disabled. People requiring artificial limbs are but a small minority. Few of them can afford to purchase their limbs, and mostly they are not only unable to do so, but suffer in many ways, usually financially, from the tragedy associated with their amputations. In effect, these limbs have to be purchased out of our taxes or contributions to welfare associations. Public money of this kind should not find

its way into anybody's pocket in the form of excess profit.

For this reason Professor Allen has determined to take every possible step against the enrichment of any organization or person from the patent royalties on this new artificial limb. A plea is made in his article that this altruistic principle

should be observed by others who, in future, may add to the development of this apparatus. The insidious dangers and temptations involved in patenting for gain essential requirements for handicapped persons must be recognized.

DIE KUNSBEEEN VAN DIE UNIVERSITEIT VAN KAAPSTAD

As gevolg van volgehoue en geïnspireerde navorsingswerk wat in die aangesig van baie moeilike omstandighede gedoen is in die Departement Ortopedie van die Mediese Skool van die Universiteit van Kaapstad, is Suid-Afrika vandag in staat om 'n revolusionêre nuwe kunseven aan die wêreld te gee. Elders in hierdie uitgawe plaas ons 'n artikel deur prof. C. E. Lewer Allen waarin die beginsels waarop hierdie been gebou is op so 'n manier uiteengesit word dat werkers dwarsoor die wêreld met werk van hierdie aard sal kan voortgaan.

Terwyl ons nou verwys na hierdie artikel, wat werklik 'n weerspieëling is van navorsingswerk op die hoogste vlak, is dit ter sake om aan te toon dat werk van vergelykbare gehalte plaasgevind het en nog plaasvind aan al ons mediese skole. Ons dink byvoorbeeld aan werk in verband met oop hart-chirurgie, die kunsnier, die kompressiepak by bevallings, spesiale snykundige prosedures, en navorsingswerk oor voeding, hartsiektes en metabiese toestande, ens.

In ons land gaan al hierdie soort navorsingswerk egter mank aan besonder ernstige knellings. Die werk wat in verband met die kunseven gedoen is, het weer opnuut ons aandag by die knellinge bepaal. By die maak van die been in die Departement Ortopedie van die Universiteit van Kaapstad was daar nie net 'n stryd om werkers te vind en vry te stel om die nodige navorsing te doen nie—en dit grotendeels in hulle vrye tyd—maar geld moes soms op byna onwaardige maniere gesoek word om met die werk te kon voortgaan. Dit is dus miskien goed om hier 'n kort perspektiewe lig op hierdie aspekte van mediese navorsing in ons land te werp.

In die eerste plaas moet ons aanneem dat alle groot navorsingsprojekte vroeër of later voor finansiële moeilikhede

te staan kom. Daar is weliswaar stigtings en ondernemings soos byvoorbeeld die W.N.N.R. wat geld ruimskots beskikbaar stel vir navorsingsdoeleindes. Daarvoor is ons dankbaar. Maar, ons sal nog baie moet leer van so 'n land soos Amerika, waar baie groot somme geld uit private bronne en allerlei stigtings beskikbaar is op 'n skaal wat ongeëwenaard is in die Westerse wêreld. Ook sal dit goed wees om die vraag te stel (al stel ons ons bloot aan 'n aantygting van naïwiteit) of dit dan nie moontlik is om op die een of ander tyd minder geld aan die navorsing van kernwapens vir militêre doeleindes te bestee en meer aan suiwer akademiese navorsing nie?

Omdat daar nie genoeg geld beskikbaar is aan ons universiteite vir volgehoue grootskaalse navorsing nie, en omdat ons universiteite hul beste navorsingskragte nie genoeg betaal nie (in vergelyking met private kommersiële ondernemings) of ook omdat die navorsers wat daar wel aan ons universiteite is te veel onderwyswerk van 'n roetine-gehalte moet doen, verloor die universiteite al meer hul beste akademië. Hierdie toestand van sake moet herstel word voordat dit tot volslae akademiese steriliteit lei.

In sy artikel oor die kunseven dui professor Allen aan dat moeite gedoen is om die been dwarsoor die wêreld te patenteer. Dit was nodig omdat daar ongelukkig 'n neiging bestaan om mediese behoeftes van ongeskikte persone te oor-kommersialiseer. Professor Allen voel dat hierdie toestand van sake prinsipieel verkeerd is, en ons wil graag langs hierdie weg 'n beroep doen op alle toekomstige vervaardigers van die been om ook in hierdie geval die ou tradisies van die mediese professie te handhaaf, naamlik om bo alles voorrang te gee aan menslike oorwegings en die beginsels van diens.

RECENT ADVANCES IN CEREBRAL PALSY, WITH SPECIAL REFERENCE TO SOUTH AFRICA *

BEN EPSTEIN, M.B., B.Ch. (RAND), M.R.C.P. (LOND.), D.C.H. (LOND.), *Paediatrician, Pretoria*

Not long ago those in South Africa who interested themselves in cerebral palsy were considered cranks and impractical visionaries. It was thought that to spend money on cerebral-palsied children was sheer waste, because nothing could be done for them. But times have changed, and in the last 10 years an entirely new concept has been created. Not only has the public attitude altered, thus giving the parents new hope, but the Central Government has recognized the justice of the claim for support and the medical profession is devoting more time to the study and treatment of this condition.

In this country, centres for the treatment of cerebral palsy have been established in Pretoria, Johannesburg, Cape Town, and Port Elizabeth. These centres (schools), subsidized

by the Department of Education, Arts and Science, provide treatment and schooling. They are all organizing residential facilities for platteland children. In addition, facilities are provided for some types of cerebral-palsied children in institutions such as Meerhof Hospital (Pretoria), the Hope Home (Johannesburg), Uplands Orthopaedic Centre (Pietermaritzburg), the Elizabeth Conradie School (Kimberley), the School for Vocational Training (Kimberley), and the Open Air School (Durban). There is a clinic and hostel for ineducable cerebral-palsied children at Townsview, Johannesburg, and a similar centre is being established in Pretoria in the near future. To date, the total number of children attending these institutions in South Africa is about 450. Developments are taking place very quickly in this field, and it is important that the medical profession should keep abreast of events.

* Paper presented at the 42nd South African Medical Congress (M.A.S.A.), East London, C.P., September-October 1959.

WHAT IS CEREBRAL PALSY?

Cerebral palsy is an unscientific term, and therefore difficult to define precisely. A year ago the International Study Group on Cerebral Palsy, which met in Oxford, England, discussed the definition for many hours (4 different definitions were put forward) and did not reach unanimity. There has also been difficulty in translating the term into Afrikaans. It is only recently that *serebraal verlamming* was accepted as the most suitable term. In South Africa the following definitions and criteria have been adopted as standards for admission to a cerebral palsy school:

Cerebral palsy is a term used to designate any abnormal alteration of movement or motor function arising from a defect, injury or disease of the nervous tissue contained within the cranial cavity. The lesion may be localized or diffuse and it may be caused by factors arising before, during, or after birth.

Among the *signs and symptoms* which may be present are the following: Motor dysfunction, convulsions, speech defects, mental retardation, behaviour disturbances of organic origin, and sensory losses, particularly in hearing and vision.

It is recommended that the non-motor-handicapped *brain-injured child*, defined as follows by Strauss and Lehtinen,¹ be considered under certain circumstances for admission to a cerebral palsy school: 'A brain-injured child is one who before, during or after birth has received an injury to, or suffered an infection of the brain. As a result of such organic impairment, defects of the neuromotor system may be present or absent. However, such a child may show disturbances in perception, thinking, and emotional behaviour, either separately or in combination.'

The *criteria for admission* are as follows:

1. All children suffering from cerebral palsy in terms of the above definition.
2. These children must be able to benefit by the corrective and educational treatment provided at the school.
3. The brain-injured child (Strauss and Lehtinen) may be admitted provided he can fit into and benefit by the school programme and is not aggressive.
4. Initial admission should be on a trial basis.

In England the 'Little Club' has recently suggested the following definition:²

Cerebral palsy is a persistent but not unchanging disorder of movement and posture, appearing in the early years of life, and due to a non-progressive disorder of the brain, the result of interference during its development.

Persistence of the infantile type of motor control such as may be seen in intellectually handicapped children, is not considered to be 'cerebral palsy'.

At the Oxford conference considerable differences of opinion on terminology and classification were voiced. Terminology and classification are important because scientific papers should be universally understood. During the demonstration of cases at the Radcliffe Infirmary there appeared to be disagreement even on clinical findings among the eminent experts present.

The *classification* most commonly used is that of the American Academy of Cerebral Palsy, which is as follows: (1) Spasticity (quadriplegia, paraplegia and hemiplegia), (2) athetosis, (3) ataxia, (4) tremor, (5) rigidity, (6) atonic form, (7) mixed form.

DIAGNOSIS

Early diagnosis is obviously important. There is, however, frequently an appreciable and embarrassing passage of time between the voicing of the mother's fears about the normality of her child, and the specific diagnosis made by the doctor. Increasing knowledge is lessening this gap. It is, I think, essential that a medical practitioner who cannot answer a mother's questions should not hesitate to say, 'I do not know'. The comforting answer frequently given, 'There is nothing to

worry about; your child will be quite well in two or three years' time', is worse than useless. Honesty can only enhance the doctor's prestige; the parents will appreciate the referral of the patient to a doctor who has made a study of child development. In practice it inevitably happens that parents will, on their own initiative, seek another opinion if they get no helpful lead from their family doctor.

What are the criteria for the determination of early cerebral palsy? These are based on the studies of child development at various schools. Arnold Gesell and Myrtle McGraw, of the USA, and André Thomas, of France, have contributed greatly to the understanding of the abnormal, through their study of the normal development of the infant. The signs to look for are the ocular signs, the Moro response, the grasp reflex, the cardinal-points sign, the crossed-extension response, the righting reaction, the trunk-flexion reflex, and automatic stepping. One must be careful not to draw definite conclusions on the results of one examination, but these results may serve to warn one to keep a careful check on a suspected case; for example, a case born with a history of an abnormal pregnancy or labour or a case that has convulsions early in life. It should be possible to diagnose most cases of spasticity by the age of 6 months, and of athetosis by the age of 1 year.

Early diagnosis may be the greatest factor in the prevention of deformities and of the development of bad posture and gait. A great deal of attention is now being given to this problem. We can expect additions to our knowledge in the near future from the André Thomas School in Paris, where Minkowski and Mme. Saint-Anne Dorgassies and others are studying the early life of prematures and full-time neonates along clinical, histological and electro-encephalographic lines. The nutritionists, the biochemists and the geneticists are adding their quota to our information. A knowledge of the disorders of lipid metabolism, carbohydrate metabolism (as in galactosaemia) or amino-acid metabolism (as in phenylketonuria) may help to solve some of the problems associated with abnormalities of the cerebral functions. The Russians have drawn attention to the importance of enzymatic systems, such as cytochrome oxidase and succinic-acid dehydrogenase, in maintaining the normality of the brain. A great deal is being done, but much still eludes us.

TREATMENT

The treatment of cerebral palsy is still in a state of confusion. Perhaps the multiple problems presented, and the great variability of the physical and mental disabilities of the children, will always result in lack of unanimity. A number of capable and intelligent individuals have worked out different methods of treatment, and have achieved some success. Different schools present completely divergent views, and sometimes success claimed by some cannot be repeated by others. Some use bracing, which others consider harmful. Some use corrective surgery, to which others are opposed. Some use techniques for breaking down various types of reflexes. Most schools use a combination of different methods, depending on the child's condition.

Phelps,³ one of the world's leading experts in cerebral palsy, enumerates the basic principles of the various methods:

1. Conditioning to establish reciprocal motion (Phelps).
2. Relaxation and motion from the relaxed position (Phelps).

3. Increasing awareness of contraction by resistive therapy (Kabat).

4. Utilization of residual patterns and of pathological reflexes (Temple Fay).

5. Inhibition of abnormal reflex patterns (Bobath).

6. Stimulation of contraction and consequent relaxation of antagonists (Rood).

7. Methods of Pohl, Swartz, Deavers, and Collis.

Conditioning is taught for the purpose of establishing fundamental patterns of motions automatically acquired by the normal baby and child. The sequence is that of the normal development of the infant.

Relaxation and motion, depending on the teaching of Jacobson. Progressive relaxation is taught by contraction and relaxation of the extremities. Numerous techniques are used to achieve this purpose.

Resistive therapy is utilized from the beginning of treatment. Instead of therapy of isolated muscles, patterns of mass movement are utilized, achieving maximum response in the muscles with each effort. Mechanical and manual methods are used to produce resistance.

Utilization of residual patterns and pathological reflexes. Temple Fay has been using primitive reflex patterns to enable movements to occur. He has utilized the amphibian and reptilian type of movement to achieve these results.

Inhibition of abnormal reflex patterns. Dr. and Mrs. Bobath have recently spent 6 weeks in Cape Town teaching therapists from all over South Africa their theories and techniques. A cerebral-palsied child develops many varied and abnormal patterns which interfere with the coordinated use of the trunk and extremities. Lesions at different levels of the central nervous system produce different abnormal reflex reactions, and Bobath techniques aim at inhibiting these reactions so that the child can relax. During the period of relaxation therapists, such as physio-, occupational or speech therapists, train the patient in their own sphere.

Stimulation of contraction and consequent relaxation of antagonists. This method was worked out by Miss M. S. Rood who operates on the two primary functions of muscles, viz. (a) movement by contraction with reciprocal inhibition of antagonists, and (b) holding simultaneous contraction of antagonists and agonists.

While physiotherapy is the basic treatment, adjuncts to treatment are available, viz., (1) Bracing as practised by Phelps and Deavers in the USA and by Crosland in the UK, (2) orthopaedic surgery, (3) drugs, and (4) special adjuncts.

Orthopaedic Surgery

Surgery has a definite place in treatment. For some time heavy attacks have been made on various surgical techniques. Some of them have been justifiably discarded, but others have been improved on.

Orthopaedic treatment may be operative or conservative. A great deal of its activity should be devoted to the prevention of deformities. No cerebral-palsy unit can function adequately without orthopaedic assistance, and without the help of specialists in physical medicine. The day-to-day control of treatment must be in their hands. Those centres that lack adequate help of this type must inevitably suffer.

G. A. Pollock, of Edinburgh, an eminent orthopaedic surgeon in this field, visited South Africa in 1955, when he participated in a symposium on cerebral palsy at the Medical

Congress in Pretoria. He recommends⁴ that surgery should be used mainly in spastics, but occasionally in athetoids. Neurectomies such as Stoffel's operation have fallen into disrepute and are rarely used nowadays. Pollock advises that surgery should, in selected cases, be regarded as one of the means of facilitating and enhancing the effect of conservative treatment, rather than as a measure of desperation to be used only when conservative treatment has failed.

The common types of operation practised are: (a) lengthening of the tendo Achillis, with capsulotomy if required, and (b) the Pollock slide operation on the gastrocnemius. Failure of these operations have been due to (i) inadequate excision or premature lengthening, (ii) lengthening of the tendo Achillis when tightness is present in the gastrocnemius alone, and (iii) the commonest cause, failure to maintain the correction obtained at operation by subsequent prolonged use of braces or splints and physiotherapeutic care.

Operations have also been devised for talipes calcaneus, talipes valgus, talipes varus, pes cavus, hallux valgus, flexor deformity of the knees, and the numerous other deformities occurring in the upper and lower limbs.

Neurosurgery has until recently had very little to offer. At present hemispherectomy⁵ is occasionally done for hemiplegia if associated with fits. Irving Cooper's work⁶ on chemo-pallidectomy for cases of chorea-athetosis may open the way for more extensive attacks on the primary lesion in the brain.

Perceptual Defects

One of the most important advances in the holistic conception of cerebral palsy is the increasing knowledge of the perceptual difficulties of these children. All cases of cerebral palsy are brain-injured—hence the admission of brain-injured children without motor defect to our schools. The signs and symptoms depend on the area and extent of brain involvement. Large numbers of children have difficulties in which, apart from motor involvement, the power of perception is impaired. This handicap may give a wrong impression of a child's potentialities and, unless tackled along the correct pedagogic lines, will give rise to all kinds of difficulties for the child and the teacher. Fortunately, in South Africa we have some excellent and devoted teachers at our schools, and they have studied this problem, are fully aware of its implications, and are engaged in research into it.

Perceptual difficulties manifest themselves in different ways, the most obvious being in the hemiplegic child who has astereognosis and is unable to differentiate between various solids in his affected hand. More subtle are the intellectual difficulties—the aphasic child, and the one who is unable to view a picture in its proper perspective and thereby to appreciate the significance of figures, letters, and words. These may appear in the form of mirror image, reversed, or upside-down. As an illustration there is the child who draws a face with the eyes outside the head.

At the Oxford conference⁷ it was pointed out that agnosias resulting from inadequate practice or experience should be distinguished from those resulting from specific cortical lesions (chiefly parietal). The former could be improved by special educational procedures more readily than the latter. The phrase 'body image' is becoming more frequently used, though it is not an exact reflection of what is meant. By 'body image' we mean a constant state of awareness of the

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position of the body; this is fundamental to normal development and behaviour. In the cerebral-palsied child its ultimate effect is largely determined by the age at which treatment is started, because if it is tackled early on one may be able to overcome some of the difficulties. These children require a great deal of movement and the opportunity to crawl and roll and feel their own bodies. It is important for them to dress and undress and to do for themselves whatever they can. This type of direction is being extensively practised in Bristol by Dr. Grace E. Woods.⁸ Mme Stella J. Albitreccia,⁹ of Paris, the famous speech therapist, has drawn up detailed tests for diagnosis and a plan for treatment of this very serious handicap.

SOUTH AFRICAN WORK

In South Africa a fair amount of experimental and research work is being carried out, but not all of it has been published. Significant contributions to our knowledge have been made by two very successful courses organized by the Cerebral Palsy Division of the National Council for the Care of Cripples in South Africa. One was on the 'Education of cerebral palsy children',¹⁰ and the other was on the 'Therapies in cerebral palsy'.¹¹ Prof. B. F. Nel,¹² Director, Child Guidance Clinic, University of Pretoria, has published a book on *Die Serebraalgestremde Kind*, which is a study of the physical and psychological handicaps of the brain-injured child. Several logopaedic students at the University of Witwatersrand have handed in M.A. theses on the speech problems of the cerebral-palsied child. The most important contribution has just been published by the National Bureau of Educational and Social Research of the Department of Education, Arts, and Science. This is *A Survey of the Physical and Mental Status of Cerebral Palsied European Children at School in the Union of South Africa*,¹³ a book written by Dr. C. H. de C. Murray, Inspector of Psychological Services in the Department of Education, Arts, and Science, and formerly Principal of the Pretoria School for Cerebral Palsy.

This survey, which covers also adults with cerebral palsy, and which was undertaken primarily at the request of the National Council for the Care of Cripples in South Africa, obtained information, by means of detailed questionnaires, about numbers, age, sex, home language, diagnosis, limbs involved, degree of disability, personal traits, intellectual ability, and scholastic status. A survey of this kind is very complicated and difficult to carry out because of the number of individuals on whom one has to draw for information; terminology, classification, and outlook on cerebral palsy varies, and correlation is not easy. Dr. Murray has performed a gigantic task; his study is a classic, and bears favourable comparison with similar studies made elsewhere. For those of us who are working in this field in South Africa it is a source of invaluable information that will guide us in determining a course of action for the increasing numbers of affected children who, in the near future, will be leaving our schools. There is a great deal of statistical information that has already been presented. Out of 380 cases at the schools, 222 were males, and 158 females. (On this basis hostel accommodation is being arranged.) Dr. Murray put these figures to a statistical test and found that this sex inequality was not significant, and was due to chance. He also found that in the hands of a competent psychologist the IQ rating, in spite of all the difficulties in testing, was reasonably accurate; he subsequently confirmed this by the critical test of children's performances at school.

One serious gap in South Africa is the lack of facilities for the treatment of the African cerebral-palsied child. We do not know how many children are involved; my own attempts in Pretoria to make a sample survey of an area like Lady

Selbourne proved a failure, even with the help of an African social worker. There were very few cases of cerebral palsy to be found, owing, I think, to two factors, viz. (1) early death due to difficulties in rearing a child under primitive living conditions, and (2) the custom of Africans in the towns of sending such children away to the country. This custom is now a diminishing factor, for millions of Africans have become detribalized and established in the urban areas. For those Africans who present themselves for treatment no special facilities are available in the large urban areas. At Edenvale Hospital, Johannesburg, cases of cerebral palsy are admitted to the wards for diagnosis and investigation. Physiotherapy and occupational therapy are begun and the mothers are shown how to carry on with such treatment at home, and asked to report back regularly as out-patients to the Department of Physical Medicine, under Dr. Cyril Adler. A proper school for African patients has been started in Umtata by the Glen Awent Roman Catholic Mission, and there are prospects of this becoming a big school with financial support from overseas.

CONCLUSION

In this very superficial survey of recent advance in cerebral palsy I have inevitably had to limit myself to a few aspects of the problem; the field is far too wide to be covered in one paper. I should like to conclude with an appeal to the medical profession in South Africa to accept the fact that rehabilitation (or, as some people call it, habilitation) has become an important facet of cerebral palsy. The profession must, by the nature of the condition, cooperate closely with non-medical personnel such as teachers, social workers, and employment officers, and with 'near-medical' personnel such as psychologists and physio-, occupational and speech therapists. The cerebral-palsy patient needs the active assistance of paediatricians, orthopaedic surgeons, specialists in physical medicine, psychiatrists, neurologists, neurosurgeons, ophthalmologists, and audiologists. The general practitioner plays an important part in this set-up because it is to him that the first approach to diagnosis will be made.

There are at least a thousand cases of cerebral palsy among the European section of our population, and there must be many thousands among the non-European section; it is therefore important to teach our medical students about this condition.

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POSTURE AND ITS INFLUENCE ON ANAESTHESIA DURING UPPER URINARY TRACT SURGERY

S. V. POTGIETER, M.B., CH.B. (PRET.), *Department of Anaesthesia, Karl Bremer Hospital, Bellville, and University of Stellenbosch*

It is a truism that the proficiency of the anaesthetist is more important than the technique he uses. Nevertheless in describing a technique of general anaesthesia for surgery of the upper urinary tract one is led to suggest that the importance of the technique may be predominant in view of the special circumstances which pertain to the patient's posture in certain operations of this branch of surgery. These circumstances are mainly the cardiovascular and respiratory derangements that occur during operation, and the post-operative atelectasis of the contralateral lung.

The nephrectomy or lateral jack-knife position imposes a severe limitation on ventilation. The table is divided in the middle and both halves can be lowered to form an apex or 'break'. A patient placed on such an adjusted table will have the upper portion of his trunk and its extremities in a steep Trendelenburg position, while the lower portion of the trunk with its extremities are in the reverse Trendelenburg position. Whilst the surgical approach is facilitated by the increase in space between the lower ribs and the iliac crest, the venous return from the lower half of the body to the heart is impeded by gravity. The great vessels (vena cava inferior and aorta) are probably distorted, which must further have a deleterious effect upon the cardiovascular haemodynamics.

The lower ribs on the side in contact with the table have virtually to bear the full weight of the patient in the lateral nephrectomy position. Thus the lower thoracic cage is compressed and expansion of the lower hemithorax severely limited. The movements of the lower hemidiaphragm are also encroached upon, if not completely restricted. Especially in the right lateral position, the larger lobe of the liver is forced higher into the thorax. With the movement of the mediastinum under the influence of gravity also contributing, the lower hemithorax undergoes a severe reduction in volume.

In the ordinary lateral position the lower lung is responsible for the larger moiety of pulmonary gas exchange. This is ascribed to its increased pulmonary blood-flow and improved oxygen uptake²⁶ and its more efficient hemidiaphragmatic movement.²⁹ In the lateral nephrectomy position it is restricted in this function. Even under controlled ventilation there is a remarkable reduction in the total volume of this lung as well as a decrease in its compliance.¹⁹

The upper lung has an increased volume, for the upper hemithorax assumes a position resembling inflation. The ribs are spread, the upper shoulder raised, and the upper hemidiaphragm caudally displaced since the abdominal viscera fall away from it. The effect of these mechanical factors is that neither lung can be effectively ventilated by the spontaneously breathing patient.

Oxygen Cost of Breathing

The work of breathing, i.e. the oxygen cost of breathing,²¹ may be multiplied during general anaesthesia⁵ and especially during surgery of the upper urinary tract. Factors

which interfere with the movements of the chest wall, lung or diaphragm will all cause an increase in the 'oxygen cost'. As the lungs become increasingly more difficult to distend, more oxygen is utilized and carbon dioxide produced. It is, therefore, theoretically possible for this increase in carbon-dioxide production to be greater than can be accommodated by an increase in the alveolar ventilation. With increased oxygen consumption and decreased effective ventilation the danger of hypoxia clearly arises. That it may be insidious has been shown by the finding that competent observers cannot infallibly detect cyanosis until the oxygen saturation of the blood has dropped from the normal 97% to $\pm 70\%$. In the anaemic patient one may wait in vain for the development of this sign and in the plethoric its occurrence may likewise be misleading while with high oxygen tensions in the lungs during the maintenance of anaesthesia, even fairly gross abnormalities of ventilation and distribution may go undetected if reliance is placed upon 'colour changes' only.

Of paramount importance is the insidious carbon-dioxide build-up which occurs with hypoventilation long before any observable hypoxia. The oxygen lack may be corrected with a few deep inhalations of oxygen, but a respiratory acidosis cannot be as speedily corrected.

Even if the tidal volumes utilized during anaesthesia are equivalent to those which the patient would exhibit during conscious respiration, they may not be adequate when postural changes alter the ventilation-distribution ratio. An extreme example of this is the hypothetical case where all the inspired gases are distributed to one lung, and the whole of the pulmonary blood-flow diverted to the other.

Pulmonary Circulation

The pulmonary circulation is a low-resistance system in which the arteries are readily distensible, and blood-flow can be greatly augmented without entailing a rise in pressure.¹⁴ The opening or closing of capillaries depends upon several factors. Thus Burton⁶ and Nichol *et al.*¹⁸ have suggested a mechanism whereby a critical 'opening pressure' determines whether or not a given capillary allows blood to flow through it. It has also been shown that local blood-flow to a lung segment depends upon the quality of its gaseous content.¹⁰ A raised carbon-dioxide tension or lowered oxygen tension results in vasoconstriction which shunts blood to better aerated portions of the same lung. The mechanism whereby this vasoconstriction is probably activated is based on the liberation of lactic acid, which effects a change in the local blood pH.¹⁷

Stroud and Rahn²⁴ have suggested that maximal pulmonary vasodilatation occurs when 30% oxygen is breathed, while Rahn and Bahnsen²⁰ in their work on dogs suggested that the mechanism for an independent regulation of blood-flow through each lung depends upon the local alveolar arterial oxygen tensions and the resistance to flow of the contralateral lung. However, blood-flow is not dependent only upon local alveolar gas content, but also on the state

of aeration and inflation of the alveoli. Björk,² in work on humans, has shown that the pulmonary blood-flow, after an hour of acutely induced atelectasis, was not diminished in the atelectatic lung, and thus caused a large venous admixture effect. The undoubtedly low oxygen tensions in the lung, when atelectatic, did not cause a reduction in its blood-flow.

When the pulmonary artery to a lung was occluded the broncho-spirometric tracings showed normal ventilation for that lung, but no oxygen uptake, while the unoccluded lung showed double its previous oxygen uptake.⁷ Thus, while some of the adjustment of pulmonary blood-flow may be brought about passively as the result of an alteration in posture, there is also evidence that the smaller branches of the pulmonary arteries are capable of constricting or dilating under the influence of a wide variety of stimuli. Probably as soon as a steady state is attained the flow of blood is regulated according to the efficiency of ventilation. The blood-flow is impaired where ventilation is poor and it is increased in the better ventilated areas.

It is not clear how general anaesthesia affects these various controlling mechanisms, but they are probably less affected by the method of anaesthesia to be described in this article than by other techniques which incorporate larger quantities of respiratory and cardiovascular depressant drugs.¹³ It seems possible that in the lateral nephrectomy position the larger moiety of pulmonary blood flows to the under lung while the larger moiety of the ventilating gases passes into the upper lung.

Choice of Anaesthetic

In view of the severe limitations and disturbances of respiration produced by the lateral nephrectomy position, controlled ventilation is obligatory, and this fact would determine the anaesthetic agents to be used. Spinal (sub-arachnoid) or epidural block cannot usually be employed without added respiratory assistance and amnesia, for the lateral nephrectomy position is more than most conscious patients can tolerate. For those who may be tempted to use a 'local' technique in order to avoid possible pulmonary complications, Brock's words⁴ may well be heeded: 'To imagine that the simple replacement of inhalation anaesthesia by local or spinal . . . will avoid such a complication shows a childlike faith born of inexperience or insufficient observation.' This fact is well illustrated in a series described by Faulconer *et al.*¹¹ in which 5 of the 8 patients who developed post-operative atelectasis had had spinal anaesthesia.

Many studies on conscious and unconscious spontaneously breathing patients have been undertaken,^{8,22,23} which proved that severe limitations are imposed on certain aspects of ventilation by the lateral nephrectomy position. Nevertheless, Dripps and Severinghaus,⁹ consider that 'these data do not apply to anaesthetized subjects, who require for tidal volume only about one-third of the inspiratory reserve volume'. However, in the studies where observations on ventilation and cardiovascular dynamics were made,^{1,15} it was concluded that the lateral nephrectomy position seriously impairs both.

It must be borne in mind that almost all general anaesthetic agents are central depressants, and their administration may lead to depression of respiration, especially if muscular relaxation is to be obtained.

All the commonly used volatile anaesthetic agents have been shown²⁴ to exert a peripheral effect also. They affect the activity of the pulmonary stretch receptors, and thus exert a profound behavioural influence upon the respiratory rate and pattern.

Controlled and Assisted Respiration

With controlled respiration there is no respiratory muscle activity and the oxygen requirement is thus diminished. As the tidal volume and rate of ventilation are under the control of the anaesthetist a greater alveolar ventilation can be achieved than is possible with spontaneous respiration, and a better state of oxygenation and carbon-dioxide elimination, together with adequate muscular relaxation can be obtained. But even controlled respiration cannot perfectly surmount the obstacles imposed by the lateral nephrectomy position. As indicated above, owing to the diminished compliance of the lower lung¹⁹ the upper lung receives the larger moiety of the ventilating volume, so much so that absorption atelectasis of the alveoli of the lower lung may well occur.

Assisted respiration is a term which is very difficult to define, since the degree of assistance can vary so greatly. Indifferently applied it is probably a hindrance to respiration, while enthusiastically applied it differs but little from controlled ventilation. In any event, it is a taxing technique for the anaesthetist and less efficient than fully controlled ventilation, and does not warrant separate consideration.

Technique

From the above considerations it is clear that any technique allowing spontaneous respiration cannot be accepted for use when the patient is in the lateral nephrectomy position. That patients do survive when such techniques are employed is irrelevant.

In this hospital a technique employing controlled ventilation is used. The average adult is premedicated with 0.65 mg. of atropine and 50 mg. of promethazine (phenergan) 1 hour before operation. Anaesthesia is induced with a test dose of 5 mg. of d-tubocurarine chloride (dTC) via an intravenous infusion, followed by a further 25 mg. of dTC and a sleep dose of about 250 mg. of thiopentone in a 2.5% solution. After the lungs have been inflated for a few breaths with 3 : 1 nitrous oxide and oxygen the patient is intubated with a large-size Magill cuffed endotracheal tube. The cuff is inflated to occlude a gas leak, and the tube anchored to the patient's neck.

Anaesthesia is then maintained with nitrous oxide and oxygen (2 : 1 litres) while ventilation is controlled through a semi-closed circle absorption system. Apnoea is maintained by hyperventilation and further doses of 5 mg. of dTC when necessary. On termination of the operation, after adequate time has been allowed for an intravenous dose of 1.2 mg. of atropine to become effective, the curarization is reversed with neostigmine, \pm 3.75 mg. These doses are not absolute and may be varied.

It is imperative for the patient to be intubated, for by this means only is it possible to provide an airway which will maintain the lowest resistance to breathing that is mechanically possible. Intubation circumvents the normal resistance encountered in the oropharynx (tongue, epiglottis, larynx and salivary secretions). Controlled ventilation with a face mask cannot be effectively achieved without

fear of distending the stomach, and a large portion of the ventilating tidal volume is inevitably wasted in alternate ballooning and collapsing of the oropharyngeal airway. There is also always the possibility of regurgitation or reflux of stomach content, which may find its way down the trachea. Further, should the surgeon inadvertently pierce the parietal pleura of the upper lung—a not too remote possibility—the disruption caused by the ensuing pneumothorax can be effectively controlled.

The tendency to allow the patient to recover consciousness in the lateral position while fixing the wound dressings must be avoided, because the lower lung is not then fully aerated. It is advisable to persevere with controlled ventilation post-operatively in the supine position for at least 10-15 minutes, so that the atelectatic area of the lower lung may be fully re-aerated.¹⁹

Controlled ventilation is not without its disadvantages, and its successful application depends upon a knowledge of the disturbances it produces. Circulation is mainly affected by unskilled intermittent positive-pressure ventilation with sustained high mean airway pressures, since the venous return is impeded, especially if the lower part of the body is in the reverse Trendelenburg position. The circulatory reserves of the patient are of paramount importance, and by the use of small quantities of depressant drugs and a light plane of anaesthesia the vasomotor system is the least depressed.

Post-operative Pulmonary Complications

The term post-operative lung complications—which is by no means strictly defined—is used to denote any event pertaining to the lungs in the post-operative period, and the inclination to imagine these events as being essentially of an anaesthetic origin should be carefully controlled. Atelectasis has always been a post-operative accompaniment especially of upper abdominal surgery, and it can be reaffirmed that neither general anaesthesia as such, nor the various aids to anaesthesia like endotracheal tubes, relaxant drugs, carbon-dioxide absorption systems, etc. constitute the threat to the lungs that is imagined by some physicians. Mushin has stated, 'Grudgingly maybe, the truth is now generally accepted that a post-operative chest is due more to the hand in the abdomen than to ether in the lungs'.

The factors determining the onset of pulmonary sequelae are mainly the site of operation, pre-existing respiratory-tract infection, and increased bronchial secretion. These are followed in the post-operative period by immobility and inability to cough effectively, whether this is the result of pain, of analgesic and central depressant drugs, or of instructions from doctors and nurses.

Atelectasis is not always recognized, for the physical signs are notoriously inconsistent and variable. Where routine X-ray examinations have been carried out after abdominal surgery, an incidence of about 50% has been reported.^{9,20} If more discriminating methods of detection are used, such as the determination of arterial oxygen saturation during the breathing of air and 100% oxygen,¹² it is found that most patients have atelectasis post-operatively. This is probably a minor clinical significance in the majority of cases, but under unfavourable circumstances it may give rise to a complicating pneumonitis.

There is a tendency for atelectasis to develop in the lower topographical area of the under lung,^{11,16,19} and the upper lung may be affected by a pneumothorax in the more conventional surgical position. Therefore an anterior approach to the upper urinary tract has recently been advocated²⁷ to circumvent some of the pulmonary and cardiovascular problems which might develop. However, these derangements may effectively be controlled during surgery in the lateral jack-knife position by using the method of anaesthesia described in this paper.

SUMMARY

The lateral nephrectomy position imposes severe limitations upon the cardiopulmonary systems and it is within these boundaries that an anaesthetic has to be administered. The lower topographical area of the contralateral lung is predisposed to post-operative atelectasis and this and other sequelae can best be dealt with by a controlled ventilation anaesthetic technique.

OPSOMMING

Vir chirurgie aan die boonste deel van die urine-weë word die pasiënt gewoonlik in 'n posisie geplaas wat meebring dat daar aansienlike beperkings op die kardiovaskulêre en respiratoriese stelsels geplaas word. As gevolg hiervan word 'n narkose-tegniek waarby gekontroleerde asemhaling ingeskaal word, as die voordeligste beskou. Oor die ontstaan van na-operatiewe longkomplikasies is daar dikwels buitensporige gissings, en die metode wat hier aanbeveel word sal daartoe bydra om veral atelektase te voorkom.

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INTERNE ASPEKTE VAN DIE AKUTE BUIK

J. D. MEYER, *Internis, Bloemfontein*

Net soos in die gevalle van ander simptome waar daar 'n verskeidenheid van oorsake is, is daar ook baie redes waarom 'n pasiënt 'n akute buik kan ontwikkel sonder dat daar 'n snykundige toestand teenwoordig is. Die mediese akute buik kan dan chirurgies behandel word met noodlottige gevolge. Daarom is dit noodsaaklik dat ons die interne toestande wat verwarring kan veroorsaak, moet onthou. Dit is onmoontlik om in die beperkte ruimte almal te noem of in besonderheid te behandel. Slegs die mees algemene toestande word dus bespreek.

Torakale Toestande

Ten eerste is daar die torakale toestande. Hier is diafragmaatiese aantasting die belangrikste. Die sensoriese toevoer van die perifere deel van die diafragma word deur die onderste 6 interkostale senuwees voorsien. (Die sentrale deel word deur die N. phrenicus voorsien.) Intratorakale letsels soos pneumonie, longinfarkt en pleuritis van verskeie oorsprong, kan deur prikkeling van die perifere diafragma 'n stralingspyn na die buik gee en dit kan taamlik erg wees. Die buikspiere is styf gespanne en daar is betreklik min teerheid. Bykomende tekens van vinnige asemhaling asook van hoes is punte ten gunste van 'n torakale toestand. Ondersoek van die borskas mag in die vroeë stadium niks of baie min tekens toon. Met tyd en geduld kan die probleem wel opgelos word, bv. deur die hand lank genoeg op die buik te hou, wanneer daar gewoonlik gevind word dat die spiere mettertyd totaal verslap. As 'n mens nog nie seker is nie, moet die pasiënt weer na 'n halfuur of een uur ondersoek word.

Toestande Afkomstig van die Kardiovaskulêre Stelsel

Ten tweede is daar 4 toestande afkomstig van die kardiovaskulêre stelsel wat 'n akute buik kan naboots, naamlik:

1. *Kroonaartrombose.* Hierdie toestand kan begin met akute bobuikpyn. Mettertyd trek die pyn feitlik altyd na die borskas en dan na die nek of arms. Die vorige geskiedenis van angina en die kliniese beeld is hier behulpsaam. E.K.G.-veranderinge, indien teenwoordig, bevestig die diagnose. In die vroeë stadium is dit gewoonlik nie van veel hulp nie, aangesien die E.K.G. eers na 'n paar dae mag verander.

2. *Kongestiewe hartversaking,* veral wanneer dit vinnig aankom, soos na 'n paroksismale tagikardie, of kroonaartrombose. Die akute lewerstuwung is verantwoordelik vir die pyn. 'n Sorgvuldige vorige geskiedenis met tekens van veneuse stuwung, edeem, kortasemigheid en 'n tasbare teer lewer, maak die diagnose hier betreklik maklik.

3. *Dissekerende aneurisma van die aorta.* Pyn wat in die borskas retrosternaal begin en dan afdaal in die buik, is 'n sterk aanduiding van hierdie toestand. Gepaard hiermee mag daar floute, dispnee, braking en hipotensie wees. Verdere kennis van hipertensie, kardiomegalie, afwesige perifere polse, veral femorale polse, haematurie, anurie en melena verhelder die toestand dan. Die beeld kan baie soos 'n pankreatitis lyk, veral wanneer so 'n retroperitoneale bloeding die seldsame verskynsel van 'n donker verkleuring op die rug gee.

4. *Middels vir behandeling van hipertensie.* Die ganglion-versperrende preparate, bv. mekamilamien hidrokloried (Mevasine) kan hier 'n tipiese paralitiese dermafsluiting met of sonder braking gee. Etlike gevalle hiervan is beskrywe en

ons sien dit soms. 'n Leë foto van die buik toon hier ook, soos by ingewandsobstruksie, uitgesette dermlusse en stig dus meer verwarring. Die geskiedenis van hoë bloeddruk en die gebruik van die genoemde middels, en ook die afwesigheid van dermklanke, sal 'n mens hier die regte rigting toon.

Metaboliese en Endokriëntoestande

Ten derde moet metaboliese en endokriëntoestande genoem word.

1. *Akute porfirie.* Akute buikpyn kan hier baie erg wees. Dit is gewoonlik koliekagtig en óf algemeen óf gelokaliseerd, veral in die epigastrium en R.I.F. Die buik is sag en daar is min teerheid—in elk geval baie minder as wat mens sou verwag met die graad van pyn. Hardlywigheid gee soms die indruk van obstruksie. Die rede vir die pyn is nie duidelik nie, maar vermoedelik is dit 'n gevolg van senu-aantasting. Die urine bevat porfirien en, wanneer dit vir 'n tyd lank staan, word dit donker. Dit word heel dikwels verkeerdlik as gekonsentreerde urine beskou, veral wanneer daar dehidrasie as gevolg van herhaalde braking teenwoordig is. Meegaande neurologiese tekens van perifere neuritis word ook dikwels gevind.

2. *Uremie.* By uremie word groot hoeveelhede urea in die derm uitgeskei, wat dan deur middel van bakteriële werking ontbind na ammoniak. Dit werk dan irriterend en 'n uremiese enteritis word veroorsaak wat deur braking, buikpyn en diaree gevolg word. Hierdie pasiënte kan as akute buikgevalle presenter. Die geskiedenis, moontlike hipertensie, ondersoek na eiwit en silinders in die urine, asook verhoogde bloedurea, is hier van hulp.

3. *Diabetiese ketose.* By die aanvang van diabetiese ketose, wat gewoonlik 'n stadige proses is, is daar braking, slaperigheid, hiperpnee en klagte van algemene buikpyn wat soms krampagtig is. Teerheid is in 'n minder mate teenwoordig. Die oorsaak van die buikpyn is onseker, maar dit mag te wyte wees aan 'n tekort aan chloried. Die kliniese beeld, asook suiker en aseton in die urine, dui hier op die antwoord.

Die aanvang van diabetiese ketose kan die gevolg wees van enige ander siekte waaraan die pasiënt toevallig mag ly. In besonder kan daar by diabetes 'n akute onsteking van die galblaas of blindederm, of 'n pankreatitis, ontwikkel. In hierdie geval kan die kliniese beoordeling baie moeilik wees. Versigtige beoordeling dus, is hier 'n vereiste.

4. *Bynierkrisis (Addison se siekte).* Ingewandssimptome kom in ongeveer 80% van gevalle voor. Verlies van eetlus is gewoonlik die aanvanklike ingewandssimptoom. Hierop volg naarteerheid, braking, en diaree. Wanneer braking toeneem word die buik teer en hard, en die pasiënt trek dit in. Dit gee die indruk van peritonitis. Dit kan dus enige intra-abdominale toestand naboots. Sodra die byniertekort aangevul, en die balans van die elektrolyte in ewewig herstel is, verdwyn die simptome.

Die oorsaak van die buikpyn staan waarskynlik in verband met die lae natrium- en chloriedgehalte. Die diagnose berus weer op die kliniese beeld soos moegheid, swakheid, hipotensie, pigmentasie, ensovoorts.

Diverse Aandoeninge

Ten vierde moet diverse aandoeninge in gedagte gehou word.

1. *Allergiese toestande*, soos allergie vir kos en die Henoch-Schönlein purpura groep. Skielike abdominale, koliekagtige pyne met teerheid en soms diaree kom hier voor. Die meganisme van die ontstaan van die simptome is eedeem van die ingewandslimvlies en purpura van die ingewandswand. Huiduitslag-purpura, gewrigspyne, ens., is hier van belang.

2. *Rumatiekkors*. Aanvalle van akute abdominale pyn met teerheid kan volg op rumatiese serositis, pleuritis, of perikarditis. Wanneer dit in die loop van 'n goed ontwikkelde aanval van rumatiekkors ontwikkel, is die diagnose eenvoudig, maar dit kan ander simptome van rumatiekkors vooruitloop. In dergelike gevalle word soms in appendektomie gedoen.

In aansluiting aan rumatiekkors is daar die kollageensiektes waarvan lupus eritematosa en poliarteritis nodosa deur middel van peritoneale serositis en arteriële letsels algemene buikpyn kan gee.

3. *Infeksies*. Hier moet na 2 toestande verwys word:

(i) Infektiewe hepatitis met die simptome van mislikheid, braking, verlies van eetlus, en pyn oor die buik en regterbuis kan in die vroeë stadium moeilik van 'n akute appendisitis onderskei word. Dikwels word hier 'n appendisektomie gedoen. Die juiste diagnose word pas later duidelik wanneer geelsug ontwikkel.

(ii) Akute gastro-enteritis met buikkrampe, braking, en diaree het geen verdere opheldering nodig nie.

4. *Hemolitiese anemie* van verskeie oorsprong. Waar daar skielike vernietiging van die rooibloedselle is, kan akute buikpyn voorkom. Daar is hier egter ander simptome soos rugpyn, kouekoors, geelsug, vergroting van die milt, ens., wat van diagnostiese hulp kan wees.

Daar is nog baie ander toestande soos gordelroos, tabes dorsalis, ens., wat ons sou kon noem maar bogenoemde is die bekendste. Die diagnose is redelik maklik mits daar 'n goeie en volledige anamnese verkry word, volledige fisiese ondersoek gedoen word, en die urine ondersoek word.

OPSOMMING

Die mees algemene interne toestande wat kan presenteer soos gevalle van 'akute buik', word kortliks genoem en bespreek.

OFFICIAL ANNOUNCEMENT : AMPTELIKE AANKONDIGING

RESCISSION OF RESOLUTION

It is notified for general information that notice of motion has been given over the names of Dr. P. F. Oates and Dr. A. G. Paterson that the decision taken in Minute 47 of the record of the Federal Council Meeting held in Pretoria in October 1958, be reviewed and rescinded at the next meeting of Federal Council.

The effect of this rescission would be that medical aid societies 'underwritten by an insurance scheme' would not automatically have recognition withdrawn from them by the Medical Association of South Africa as *approved* medical aid societies.

A. H. Tonkin
Secretary

Medical House
35 Wale Street
Cape Town
2 February 1960

HERROEPING VAN BESLUIT

Kennis geskied hiermee ter algemene inligting dat dr. F. P. Oates en dr. A. G. Paterson kennis gegee het om die besluit wat geneem is, nr. 47 van die Noutle van die Vergadering van die Federale Raad wat in Oktober 1958 in Pretoria gehou is, te hersien en te herroep op die volgende vergadering van die Federale Raad.

Die gevolg van hierdie herroeping sal wees dat erkenning as goedgekeurde mediese hulpverenigings nie outomaties deur die Mediese Vereniging van Suid-Afrika teruggetrek sal word van mediese hulpverenigings, wat deur versekeringskemas onderskryf is nie.

A. H. Tonkin
Sekretaris

Mediese Huis
Waalstraat 35
Kaapstad
2 Februarie 1960

PASSING EVENTS : IN DIE VERBYGAAN

Mr. H. Perkin, F.R.C.S. (Eng.), F.R.C.S. (Edin.), has commenced practice as a specialist surgeon at 516 Medical Centre, Heeren-gracht, Cape Town. Telephones: Rooms 2-8689, residence 6-6570. Until recently Mr. Perkin was senior surgical registrar at Groote Schuur Hospital, Cape Town, and formerly held appointments at the Postgraduate Medical School of London at Hammersmith Hospital; the Hospital for Sick Children, Great Ormond Street, London; and at the Southend General Hospital.

Dr. H. Perkin, F.R.C.S. (Eng.), F.R.C.S. (Edin.), het begin om as spesialis-chirurg te praktiseer te Mediese Sentrum 516, Heeren-gracht, Kaapstad. Telefoon: Spreekkamer 2-8689, woning 6-6570. Dr. Perkin was tot onlangs senior chirurgiese registrateur aan die Groote Schuur-Hospitaal, Kaapstad, en hy was voorheen verbonde aan die Nagraadse Mediese Skool van Londen by die Hammersmith-Hospitaal; die Hospitaal vir Siek Kinders, Groot Ormondstraat, Londen; en die Algemene Hospitaal Southend.

Commonwealth Medical Advisory Bureau, London. The Medical Director of the Commonwealth Medical Advisory Bureau has kindly supplied the Editor of the *Journal* with a copy of the revised edition of the *Summary of Regulations for Postgraduate Diplomas and of Courses of Instruction in Postgraduate Medicine*, which his Bureau issues. Copies of this publication are also available at the medical schools of South African universities. The present issue of the *Summary of Regulations* contains chapters on anaesthetics, bacteriology, basic medical sciences, cardiology, chest

diseases, child health, dermatology, E.N.T., entomology, environmental control, gynaecology, hospital appointments, industrial health, laryngology, locums, medical administration, medical defence, medical registration, medical statistics, medicine, neurology, obstetrics, occupational health, ophthalmology, orthopaedic surgery, otology, paediatrics, parasitology, pathology, physical medicine, psychiatry, public health, radiodiagnosis, radiotherapy, isotopes, surgery, tropical medicine and hygiene, tuberculosis, urology, and venereal diseases. Further information may be obtained from Dr. R. A. Pallister, O.B.E., M.D., M.R.C.P., D.T.M. & H., Medical Director, Commonwealth Medical Advisory Bureau, BMA House, Tavistock Square, London, W.C. 1.

National General Practitioners' Group (M.A.S.A.). This Group has now established a central office at Medical House, 35 Wale Street, Cape Town. A Secretary will be in attendance during the mornings only, with a possibility of full-day attendance later. All communications should be forwarded to P.O. Box 643, Cape Town. The telephone number of the office is 3-2022. This office will also act as the headquarters for the Cape Western Sub-Group of the National General Practitioners' Group.

Proposed SANTA Centre at Matatiele. All official Government approvals have now been received for the establishment of a 250-bed SANTA Tuberculosis Treatment Centre at Matatiele. An old military encampment, which has not been in use since the end of the last war, will be converted for this purpose. The

buildings are in a good state of repair and the grounds are neat and tidy but all roof covering will have to be replaced and certain structural alterations are necessary. Since 1952 SANTA has established 29 non-European Tuberculosis Treatment Centres which function as austerity hospitals. Over 22,000 patients have been treated in these Centres during that time. Two additional Centres, at Pietermaritzburg and Fort Beaufort, are in process of construction and the Centre at Matatiele will be SANTA's 32nd Tuberculosis Centre.

The National Secretary of the South African National Tuberculosis Association, Dr. M. J. Broderick, accompanied by the Association's Technical Secretary, Mr. A. J. W. Drysdale, visited Matatiele, East Griqualand, on Thursday 4 February and addressed a public meeting in the Town Hall which was convened by the Mayor of Matatiele, Councillor C. H. W. Gray. It is hoped that this public meeting will arouse a great deal of local enthusiasm for the work of the 5-year old Matatiele Branch of SANTA which will administer the Centre.

Universiteit van Stellenbosch, Hart-long Groep. Die volgende vergadering van die Hart-long Groep word, weens onvoorsiene omstandighede, uitgestel tot Donderdag 18 Februarie, om 8.15 nm. in die Farmakologie-Lesingkamer, Universiteitsgeboue, Karl Bremer-Hospitaal, Bellville, Kaap. Die program sal bestaan uit: (1) 'Hemato-serologiese probleme in die bloedoortappings' deur dr. H. D. Brede, (2) 'n Geval van konstriktiewe perikarditis veroorsaak deur aktinomykose' deur dr. D. G. le Roux, en (3) 'n Kritiese studie van die tydsgete vitale kapasiteit' deur dr. H. P. Wassermann.

Mr. André Roux, M.B., Ch.B. (Cape Town), F.R.C.S., F.R.F.P.S., has commenced practice as a specialist orthopaedic surgeon at 502 Medical Centre, Heerengracht, Cape Town. Telephones: Rooms 2-7438, residence 97-4661. Mr. Roux was formerly Orthopaedic Registrar at the Karl Bremer Hospital, Bellville, Cape.

Dr. André Roux, M.B., Ch.B. (Kaapstad), F.R.C.S., F.R.F.P.S., het begin praktiseer as 'n spesialis ortopediese chirurg te Mediese Sentrum 502, Heerengracht, Kaapstad. Telefoon: Spreekkamer 2-7438, woning 97-4661. Dr. Roux was voorheen Ortopediese Registrateur by die Karl Bremer-Hospitaal, Bellville, Kaap.

Dr. J. J. D. Jacobs, M.B., Ch.B. (Kaapstad), M.Med.Chir. (Pretoria), het nou as spesialis-chirurg begin praktiseer te Van Riebeeck Mediese Gebou 409, Pretoria. Telefoon: Spreekkamer 2-9645, na-ure 3-7097.

Nadat dr. Jacobs sy M.Med.Chir-graad verwerf het, het hy verskeie vooraanstaande chirurgiese klinieke in die V.S.A., die V.K. en die Vasteland besoek. In 1958 was hy voltydse chirurg aan die Karl Bremer-Hospitaal, Bellville, Kaap, en eerste assistent in die Departement van Chirurgie aan die Stellenbosse Geneeskundige Fakulteit. Hierna was hy tot onlangs werksaam in die kinderchirurgie aan die Rooikruis Oorlogsgebed-Hospitaal vir Kinders te Rondebosch, Kaap, onder prof. J. H. Louw, van die Universiteit van Kaapstad.

NEW PREPARATIONS AND APPLIANCES : NUWE PREPARATE EN TOESTELLE

DIHYDERGOT TABLETS

Sandoz Pharmaceutical Products announce the introduction of Dihydergot tablets, and supply the following information:

Composition. Dihydergot tablets contain 1 mg. of the methanesulphonate of dihydroergotamine, an ergot alkaloid obtained by the partial hydrogenation of ergotamine.

Dihydergot is a relatively non-toxic drug with few side-effects even when given in high doses. Central toxic disturbances do not occur; nausea or vomiting are very infrequent accompaniments of administration.

Mode of action. Dihydergot possesses a strong sympatholytic action with a negligible effect on blood pressure or on uterine activity except at term. It may safely be given by mouth and in moderate dosage during pregnancy.

Dihydergot elicits a strong vasotonic effect on distended extracranial arteries, thus relieving the stretching of pain-sensitive structures. This action is limited only to those vessels which are pathologically distended; the peripheral circulation is not affected. Dihydergot is therefore extensively used in attacks of migraine and in other headaches of vascular origin.

Indications for Dihydergot tablets and ampoules. Migraine attacks and the prevention of migraine; tension headaches and histaminic cephalalgia or Horton's syndrome, headaches following lumbar puncture and spinal anaesthesia, post-operative retention of urine, hypotension and neurocirculatory asthenia.

Dosage. For migraine prophylaxis 1-2 tablets 3 times daily, and for migraine attacks 2-3 tablets repeated after $\frac{1}{2}$ hour if necessary. Severe cases require Dihydergot injections or Cafergot orally or rectally.

Distributors. Alex. Lipworth Ltd., P.O. Box 4461, Johannesburg, and Alex. Lipworth (Rhodesia) Ltd., P.O. Box 1769, Salisbury.

MARPLAN

Roche Products (Pty.) Ltd. announce from their laboratories in Basle, Switzerland, the synthesis of a new monoamine regulator with an astonishing double action: (1) Mood elevation, psycho-stimulation, e.g. an antidepressant; and (2) increased coronary blood flow, decreased peripheral resistance with lowered blood pressure.

Chemistry. Marplan contains 1-benzyl-2-(5-methyl-3-isoxazolyl-carbonyl) hydrazine, a monoamine oxidase regulator or inhibitor.

Pharmacology. (MAO) monoamine oxidase is an enzyme widely distributed in the body. It oxidatively deaminates amines to pharmacologically inactive acidic derivatives. Marplan by inhibiting MAO increases the tissue levels of serotonin (5-hydroxytryptamine), norepinephrine (noradrenalin) and epinephrine (adrenalin).

Indications

(a) *Psychiatry.* In the treatment of the depressive phase of the manic-depressive psychosis; in endogenous depressions and generally in affective disorders with depression as a symptom; in involuntal and senile psychosis; in schizophrenia where the predominant symptom is depression. It can be used in conjunction with ECT and has in some cases replaced ECT therapy.

(b) *Cardiology.* In the treatment of mild hypertension and in coronary artery diseases as a dilator, e.g. in angina of effort as well as in coronary thrombosis.

(c) *The double effect of Marplan* makes it an almost ideal drug for the depressed patient with acute or chronic coronary artery diseases.

Toxicity. Although Marplan is very potent, no hepato-toxic or haemato-toxic effects have been demonstrated. Side-effects are good indicators of individual sensitivity.

Side-effects. Irritability, hypotension, insomnia, dizziness, constipation, dryness of mouth.

Contra-indications. Acute excitatory states and psychomotor hyperactivity. Jaundice and renal failure.

Dosage. Variable: From an initial dose of 30 mg. daily to a maintenance of approximately 10 mg. daily (the preparation has accumulative effect and dosage must be controlled).

Samples and literature are obtainable from Roche Products (Pty.) Ltd., P.O. Box 6158, Johannesburg.

PENITRIAD GRANULES

Maybaker (S.A.) (Pty.) Ltd., announce the introduction of a granule presentation of Penitriad for the preparation of a 2 fl. oz. flavoured suspension, and supply the following information:

One teaspoonful of the suspension is equivalent to 1 tablet of Penitriad which contains potassium penicillin V equivalent to 60 mg. of the free acid, sulphadiazine 167 mg., sulphadiazine 167 mg. and sulphathiazole 167 mg.

Penitriad is indicated for the treatment of infections due to penicillin and sulphonamide-sensitive organisms, and in particular to infections of limited sensitivity to these agents since the activity of the combination is likely to be appreciably greater than that of either penicillin or a sulphonamide alone. For adults the dosage is 2 teaspoonfuls of suspension or 2 tablets initially followed by 1 or 2 teaspoonfuls of suspension or 1 or 2 tablets at 4 or 6 hourly intervals. For children $\frac{1}{2}$ the adult dosage is advisable and for infants about $\frac{1}{4}$ the adult dosage is suggested. However, these doses may be increased at the discretion of the physician.

BOOK REVIEWS : BOEKBESPREKINGS

HIATUSBREUKE

Die Behandlung von Hiatushernien und Refluxösophagitis mit Gastropexie und Funduplicatio. Von Prof. Dr. R. Nissen und Dr. M. Rossetti. VIII + 153 Seiten. 56 Abbildungen in 141 Einzeldarstellungen. Ganzleinen DM 49.50. Stuttgart: Georg Thieme Verlag. 1959.

In hierdie boek sit die skrywers hulle metode van behandeling van hiatusbreuke en reflux-esofagitis uiteen. Dit bestaan uit 'gastropexie' deur 'n abdominale toegang en in sekere bepaalde gevalle word daar bygevoeg 'n funduplicatio' waarby die fundus van die maag om die abdominale deel van die esofagus gevou en so bevestig word dat die esofagus feitlik deur 'n regter van maagwand loop. Die onderwerp word mooi logies behandel in die volgende hoofstukke:

Klassifikasie en kliniese beeld van hiatusbreuke; indikasies vir chirurgiese en simptomatiese behandeling; keuse van operasie; operatiewe tegniek; verslae en röntgenologiese bevindings by verteenwoordigende gevalle; en die resultate in 120 pasiënte.

Die werk is belangrik omdat hierdie metode volgens die skrywers 'n kleiner ingreep is wat beter resultate lewer as die gebruikelike metodes. Die gebruik van die funduplicatio' prosedure vir reflux-esofagitis (met of sonder hiatusbreuk) is ook 'n belangrike voorstel i.v.m. 'n probleem wat soms moeilik kan wees.

Die boek is uitstekend gedruk en baie goed geïllustreer. Dit word maklik gelees en kan met redelike gemak binne 5-6 uur deurgelees word, omdat dit so ryklik geïllustreer is. Dit is 'n belangrike bydrae tot die probleem van die behandeling van hiatusbreuke en reflux-esofagitis. J.K.B.

ORTHOPAEDICS OF THE SPINE AND PELVIS

Handbuch der Orthopädie. Band II. Spezielle Orthopädie Rumpf (Wirbelsäule und Becken). Herausgegeben von G. Hohmann, M. Hackenbroch und K. Lindemann. xx + 1,136 Seiten. 850 Abbildungen. Ganzleinen DM 174.00. Stuttgart: Georg Thieme Verlag. 1958.

The 1,134 pages of this volume, which is the second of the series, are stuffed with facts and figures concerning the spine and pelvis. The surgical technique is somewhat neglected, but this is amply compensated for by the numerous other aspects which are included. The book covers embryology, development, ossification, and disease conditions. Much space and emphasis are devoted to lordosis, kyphosis, and traumatic and metastatic defects of the spine; and similar detailed treatment is given to defects of the pelvis. The differential diagnosis of the various conditions is well dealt with, and the whole volume is studded with illuminating illustrations.

A graphic description is given of the proper examination of the human spine and the abnormal curvatures to which it is subject—a matter too often neglected in standard text-books.

The volume is accompanied by an illustrated section on the aspiration of a hip joint or the injection of cortisone into the joint. This section also deals with the anatomy and relations of the sciatic nerve and capsule of the hip joint.

In conclusion the reviewer desires to say that this short review is no true reflection of the contents of this tremendous work. D.J.H.

ELECTRO- AND ACTINOTHERAPY

The Principles and Practice of Electrotherapy and Actinotherapy. By Bryan O. Scott, M.R.C.S., L.R.C.P., D.Phys.Med. Pp. viii + 314. 168 figures. 27s. 6d. net. London: William Heinemann Medical Books Ltd. 1959.

This small book is written for students of physiotherapy who propose to take the examination of the Chartered Society of Physiotherapists or the equivalent. The book is divided into 2 parts.

Part 1 deals with elementary electrotherapy, which is written in a simple yet graphic manner, with helpful parallels which enable the student who has not had a basis of physics at school to approach the subject without confusion. It is, in fact, a text-book of applied physics in which the physical principles of therapeutic methods are clearly defined, and their application to therapeutic devices indicated. Biological effects of electric currents are well described, with adequate discussion of physiological responses of specific types of treatment. The current methods

of electrodiagnosis, including electromyography, are simply and accurately described.

Part 2 consists of actinotherapy. The physics and history of this subject are described and the latest sources of ultra-violet light discussed. It is a pity that so much of the traditional mythology relating to this form of treatment is perpetuated.

The author has emphasized the salient points by recourse to heavy print, which not only detracts from the flow of the text, but is irritating to the reader. The book is otherwise well produced and illustrated, and is recommended to the student of physiotherapy and to the general practitioner who desires an understanding of the many forms of therapeutic apparatus in current use. C.W.C.

MEDICAL BIOPHYSICS AND MATHEMATICS

Blood Pressure Sounds and their Meanings. Part 2. Aetiology of Melanotic Cancer. By John Erskine Malcolm, B.Sc., M.B., Ch.B., F.R.C.S. Pp. vii + 70. 14 figures. 12s. 6d. London: William Heinemann Medical Books Ltd. 1959.

This booklet follows on the author's previous published work on blood pressure sounds, their physical properties and mathematical implications. The cardiovascular system is considered as an energy transmission line and the energy systems involved universally in nature are correlated. Thus, photosynthesis, the interaction of biochrome systems such as melanoids, carotenoids and haemoglobins are considered. These are correlated with rotating flow in blood, vascular waves, cavitation etc.

To the ordinary medical practitioner and consultant, ill-equipped with knowledge of modern physics and higher mathematics, the work is quite incomprehensible. It is written for a very select audience of trained biophysicists and mathematicians. These readers will be able to follow the arguments and appreciate the relations of melanotic cancer to blood pressure sounds as well as the mathematical implications of the author's thesis. V.S.

ENDOCRINE DISORDERS

Major Endocrine Disorders. 3rd edition. By S. Leonard Simpson, with the collaboration of A. Stuart Mason and G. I. M. Swyer. Pp. vii + 459. Illustrations. English price 50s. London, New York, Toronto: Oxford University Press. 1959.

This is a nicely produced book, easy to read, presumably written primarily for the general physician (it seems hardly suitable for the student on the one side nor the endocrinologist on the other). There is a certain lack of balance; although it is entitled *Major Endocrine Disorders* yet a so-called new variety of male pseudohermaphroditism is described in detail, based on two cases which were reported by one of the co-authors and which were almost certainly really examples of gonadal dysgenesis (ovarian hypoplasia). As opposed to this, the section on diabetes is absurdly short and would be better omitted. The word 'prediabetes' does not occur.

'Adipose gynism' and 'adipose gynandrim' have received various synonyms, including 'Simpson's syndromes'—it seems a shame that the majority of endocrinologists do not believe in their existence.

A number of endocrinological errors occur; e.g. that semilente insulin acts more rapidly than soluble; that 'plasma phosphatase' is almost invariably raised in hyperparathyroidism; that patients with Turner's syndrome (gonadal dysgenesis) are completely lacking in libido and so on.

There is certainly a fair set of references, which seem, however, to have been chosen largely because they agree with the views set out in this book. To get a fairer survey it would be necessary to supplement it at least with Bishop's *Recent Advances in Endocrinology*.

I cannot recommend this book wholeheartedly, but certainly the run-of-the-mill, more non-controversial, disorders are well presented for the physician. W.P.U.J.

OBSTETRICS AND GYNAECOLOGY

A Synopsis of Obstetrics and Gynaecology. 12th edition. By Aleck W. Bourne, M.A., M.B., B.Ch. (Camb.), F.R.C.S. (Eng.), F.R.C.O.G. Pp. vii + 632. 167 figures. 35s. Bristol: John Wright & Sons Ltd. 1959.

This little synopsis has now reached its twelfth fully revised and augmented edition. In the past it has proved itself to be an emi-

nently useful synopsis, and the present one even slightly outdoes its predecessors. The author has again shown himself to be an excellent teacher in his selecting and presenting, in synoptic form, of practically all the available important facts of obstetrics and gynaecology. If read together with well-taken lecture notes they should enable any normal student to master these subjects satisfactorily without much help from other sources.

Much old matter has been replaced by newer (while some new headings have replaced older ones). Perhaps less space should have been allowed for the discussion of embryological considerations. Incidentally, Goldschmidt (1955) teaches that male characteristics are carried, not by the Y-chromosomes, but by the autosomes in the nuclear matter. But one would have welcomed more information about the biological procedures used in the diagnosis of early pregnancy. The *Xenopus* test (developed by a South African scientist) deserves to be much more widely known and used. The chapter on the newborn child is excellent and useful; the one on X-ray pelvimetry is noteworthy especially in its evaluation of the worth of this procedure and its true indications.

The author has incorporated a new short chapter on intersex at the end of the book and it should serve to draw attention to the mechanism of this condition.

One does not hesitate to recommend this little book for use by students. Its teaching is sound throughout and it covers, in a small but well-printed volume, a surprisingly wide field in both obstetrics and gynaecology. G.C.A.vdW.

YEAR BOOK OF CANCER

The Year Book of Cancer 1958-59. Compiled and edited by R. L. Clark, Jr., B.Sc., M.D., M.Sc. (Surgery), D.Sc. (Hon.) and R. W. Cumley, B.A., M.A., Ph.D. Pp. 570. 202 figures. \$8.00. Chicago: Year Book Publishers, Inc. 1959.

The Year Books have come to mean something significant in the doctor's life and the *Year Book of Cancer*, now in its third year, ably carries on the traditions of the series.

The editors have wisely called on many of the staff members of the University of Texas M.D. Anderson Hospital and Tumour Institute for assistance in answering questions, and on the staff members of the Okayama University Medical School, Japan, for the selection of the Japanese literature, a new and welcome departure and a tribute to the culture that has produced Noguchi.

The field of oncology is so vast and the literature so extensive that very severe selection had to be undertaken. The result is a concise résumé of the progress of the work during the year. Surgeons and radiotherapists will need this book. T.S.

SCHOOL MEDICAL SERVICE

The School Health Service. By S. Leff, M.D., D.P.H. and Vera Leff. Pp. viii + 316. 2 illustrations. 30s. net. London: H. K. Lewis & Co. Ltd. 1959.

The authors state in their introduction that 'a study of the school medical service can take us through the efforts and achievements of the past 50 years, reveal to us the problems and how they were met, and indicate how the future health service can best develop'. A comprehensive survey is made of the development of the school medical service in England since its inception, and a full report made of the service as it is today.

Chapters on the maladjusted child and the physically and mentally handicapped, on measures for promoting good health, and on infectious diseases in schools, make interesting reading and are most informative.

The book is a 'must' for medical inspectors of schools and may with profit be read by others who wish to acquire some knowledge of the working of a school medical service. L.vd.C.

BIOLOGICAL PSYCHIATRY

Biological Psychiatry. Edited by Jules H. Masserman, M.D. Pp. xvi + 338. Illustrations. \$9.75. New York and London: Grune & Stratton, Inc. 1959.

This volume, comprising the scientific proceedings of the Society of Biological Psychiatry in San Francisco in May 1958, is compendious in coverage of its defined field. Neuro-anatomical and neurophysiological topics include the caudate nucleus and the putamen, and the reticular formation. Clinical research is

represented by papers dealing with metabolic and specific chemical features in schizophrenia and manic depressive psychosis. Psychopharmacology makes a wide range of contributions in the realms of tranquilizers, psychic energizers, anticholinergics, and psychomimetic agents, in relation to a variety of personality, somatotyping and conditioned-reflex techniques. Addresses of a coordinating nature by Masserman, Hoch, Freyhan and Wikler bring perspective into these most important proceedings. L.A.H.

PULMONARY VENTILATION

Symposium on Pulmonary Ventilation. Edited by R. P. Harbord and R. Woolmer. Held in Leeds on 19 February 1958 under the auspices of the *British Journal of Anaesthesia*. Pp. 109. 28 figures. 12s. 6d. net. Altrincham: John Sherratt & Son. 1959.

In this edited report of a one-day symposium on some problems in the study of pulmonary ventilation there is matter of interest to the physiologist, the pathologist, the anaesthetist, the physician and the paediatrician. Electronics and gadget enthusiasts will have their appetites whetted and the general reader, be he never so humble, will find just enough discussion on high-powered topics to stimulate his curiosity without dulling his receptivity. Ventilation-perfusion ratios, CO₂ narcosis, respiratory acidosis and alveolar gas tensions are discussed in relation to clinical problems arising in asthma, in emphysema and bronchitis, in positive-pressure respiration, in anaesthesia, in neonatal apnoea, and in other situations likely to confront any practitioner.

This well printed and amply illustrated book, which is on sale for 12s. 6d., cannot claim final authority but it is an excellent aperitif and all practitioners would do well to consult it as an introduction to solid meat, and as an indicator of the expanding horizons of clinical practice in conditions affecting respiratory function. C.S.J.

RADIO-ISOTOPE TECHNIQUES

Radioisotope Techniques in Clinical Research and Diagnosis. By N. Veall, B.Sc., F.Inst.P. and H. Vetter, M.D. Pp. xii + 417. 74 figures. 57s. 6d. + 1s. 9d. postage. London: Butterworth & Co. (Publishers) Ltd. South African office: Butterworth & Co. (Africa) Ltd., P.O. Box 792, Durban. 1958.

Written by two of the foremost exponents in the field, this is unquestionably an authoritative volume of outstanding merit. The work covers almost the whole range of information in a truly detailed yet simple and lucid manner.

Commencing with a clear introduction to the relevant aspects of radio-activity the text passes on logically and easily to a discussion of electronic equipment used in detecting and measuring ionizing radiations. The authors have very wisely allotted about half the book to the presentation of these basic physical principles, recognizing that a sound knowledge of them is necessary to their application in the elucidation of the various clinical problems.

In the second part the exposition reaches its height. Here the different clinical and research techniques are adroitly handled and the reader is left with a vivid picture of the respective techniques.

A very short chapter on isotope therapy seems to have been added to give full measure. Unfortunately, because of its brevity, it has detracted from the general excellence of the book. J.M.G.

PULSE-TEST FOR ALLERGY

The Pulse Test for Allergy. By A. F. Coca, M.D. Pp. vii + 168. 13s. London: Max Parrish. 1959.

This is a book for the layman and explains in simple language the author's well-known thesis that there is a direct connection in many complaints between the symptoms, the patient's diet, and the pulse rate. In other words, food allergies are a frequent but generally unsuspected cause of many ailments and the foods responsible can be identified by a systematic examination of the pulse rate, which is often accelerated by the eating of an allergenic food. The patient is directed how and when to take the pulse, to record the items of his diet and to correlate and interpret the findings.

The author explains that this teaching does not fit into present-day medical practice because the doctor lacks the time to acquire the considerable experience necessary to enable him to interpret

the pulse-diet record and is reluctant, because of his orthodox training, to embrace the new and radically different approach.

Some readers will become impatient with the author's numerous case histories of almost miraculous cures by this technique in a variety of dissimilar morbid conditions. Others, impressed with the author's reputation in the world of allergy and his previous scientific publications on the subject, may be inclined to pursue further investigations in this field in order to test the attractive hypothesis.

D.O.

SISTEMIESE ANATOMIE

Anatomy of the Human Body. Deur R. D. Lockhart, M.D., Ch.M., F.R.S.E., G. F. Hamilton, B.Sc., M.B., Ch.B. en F. W. Fyfe, M.A., M.B., Ch.B. Pp. ix + 697. 965 illustrasies. 105s. net. Londen: Faber en Faber Bepker. 1959.

Hierdie handboek oor die sistematiese anatomie bied iets heeltemal nuuts. Die skrywers het hulle ten doel gestel om die studie van

die anatomie te vergemaklik deur middel van kort beskrywings en veelvuldige illustrasies. Daar is in werklikheid baie min bladsye wat nie een of meer illustrasies bevat nie. Die illustrasies is duidelik en ter sake sodat sommige van hulle herhaal word om by die teks te pas en terugverwysing uit te skakel.

Die perifere senuweestelsel is op 'n besondere manier uitgebeeld. Wysers dui direk uit die teks na die afbeelding van die struktuur wat beskryf word sonder dat die wysers mekaar onnodig kruis. Hierdie aanpassing van beskrywing en illustrasie by mekaar is op sigself 'n bewys van die sorg waarmee hierdie boek voorberei is. Die sentrale senuweestelsel word deur middel van gekleurde drie-dimensionele illustrasies uitgebeeld, en dikwels word die byskrifte in dieselfde kleur as die kerne en bane gedruk om identifikasie te vergemaklik. Soms vorm geel bane en veral geel byskrifte nie genoeg kontras met die wit agtergrond van die bladsy nie en val dit effens moeilik om te lees.

Die toepassing van die kennis van die anatomie word herhaaldelik sterk beklemtoon deur woord en beeld. Die boek kan sterk aanbeveel word by studente en dosente.

J.F.V.E.K.

CORRESPONDENCE : BRIEWERUBRIEK

ELI LILLY MEDICAL RESEARCH FELLOWSHIP (SOUTH AFRICA)

To the Editor: Applications for the 1960 award of this Fellowship may now be submitted and must reach the undersigned not later than 30 April 1960.

The detailed conditions governing the award of this Fellowship appear in the issue of *Medical Proceedings* dated 30 January 1960 on p. 33. They may also be obtained from the undersigned.

H. A. Shapiro, Ph.D., M.B., Ch.B., F.R.S.S.Af.

Honorary Chairman: Selection Committee, Eli Lilly Medical Research Fellowship (South Africa)

P.O. Box 1010
Johannesburg
27 January 1960

CIRCULAR FROM MEDICAL COUNCIL

To the Editor: The circular sent by the Registrar of the South African Medical and Dental Council to all medical practitioners directing their attention to Chapter IV of the Medical, Dental and Pharmacy Act, Act No. 13 of 1928, brings to mind a quotation from the writings of Lord Lister.¹

'To intrude an unskilled hand into such a piece of Divine mechanism as the human body is indeed a fearful responsibility.'

Cyril Wiggishoff

224 Lister Buildings
Jeppe Street
Johannesburg
26 January 1960

1. Cawkwell, I. (1959): *Ann. Roy. Coll. Surg. Engl.*, 25, 267.

MEDICAL INSURANCE

To the Editor: Several colleagues have expressed surprise that I took the part of the insurance companies in the discussion that took place at the meeting of the Southern Transvaal Branch of the Medical Association of South Africa on 19 January.

What I sought to dispel was the notion that the insurance companies were out to take advantage of the profession. There can be little doubt that some of their manoeuvres were ill-timed and clumsy, but that does not make them our enemies. With tact and diplomacy on both sides it ought to be possible to devise a formula which will enable the hospital class of patient to obtain private medical service via the insurance companies and the medical man to obtain his customary fee from the better-off section of the community.

The fact that insurance companies operate for profit does not controvert the fact that their medical schemes operate at a loss; but, whatever the case, we need not concern ourselves with their financial policies. Our preoccupation should be to protect our interests with reasonableness and far-sightedness.

David Perk, M.D., D.P.M.

601 Medical Centre
Jeppe Street
Johannesburg
26 January 1960

ABOLITION OF THE PREFERENTIAL MEDICAL AID SOCIETY TARIFF

To the Editor: The ever increasing annoyances and frustrations of doctors in general, and of general practitioners in particular, over the medical aid society tariff rates, and the endeavours of the newer medical insurance schemes to obtain such preferential rates, have convinced me that the wisest solution would be the abolition of the tariff.

When first instituted, this tariff met a very great need and served both a section of the population and the doctors very well, so well indeed that too many have endeavoured 'to climb upon the wagon'. No longer do medical aid societies give assistance only to those of the population who cannot afford medical treatment, and industry has been all too quick to capitalize on the doctors' reduced fees. I am fully aware of all the arguments put forward to show how the doctor benefits from such schemes, but nevertheless maintain that it has now become a case of the doctors subsidizing industry.

Should the tariff rate be scrapped, this need not lead to the abandonment of medical aid societies, but the agreement would be solely between the society and the patient. The doctor would submit his account in detail to the patient (his customary private fee, modified when the patient's circumstances justified it). The patient would then obtain from his society whatever portion of the account he was entitled to. This would enable the society to have any tariff rate of their own, according to the size and scope of the society. The doctor would, of course, have lost his guaranteed payment of account, but I do not think his total loss would be any greater than at present, when accounts are still unpaid because the patients exceed their benefits or leave the society before the account is rendered.

The greatest advantage to the profession as a whole would be the end of the continual haggling over fees. After 3 years' service on our local Contract Practice Sub-Committee, I have found these continued wranglings most degrading to the status of the profession.

Finally, the medical insurance schemes which endeavour to induce patients to seek preferential rates from their doctors would have no such attractive tariff dangling in front of them.

I can foresee objections to this scheme coming from specialists, but I think their objections could largely be met by general practitioners who, when referring a patient to a specialist, could inform him of the financial status of the patient. I understand this is not often done, but if the general practitioner is really a family doctor, this confidential information to a specialist should be within his scope. Naturally, a patient going direct to a specialist could hardly expect any reduction in the specialist's normal fee.

David Martyn, M.B., Ch.B.

1018 Colonial Mutual Buildings
West Street, Durban
28 January 1960